



Nemko Test Report: 5058RUS1

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 24, Subpart E
Broadband PCS Repeaters

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

TESTED BY:

A handwritten signature in dark ink, appearing to read 'David Light', is written over a horizontal line.

David Light, Senior Wireless Engineer

DATE: 29 June 2007

APPROVED BY:

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

Harry Ward, Verifier

DATE: 29 June 2007

Number of Pages: 45

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

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 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".



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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.

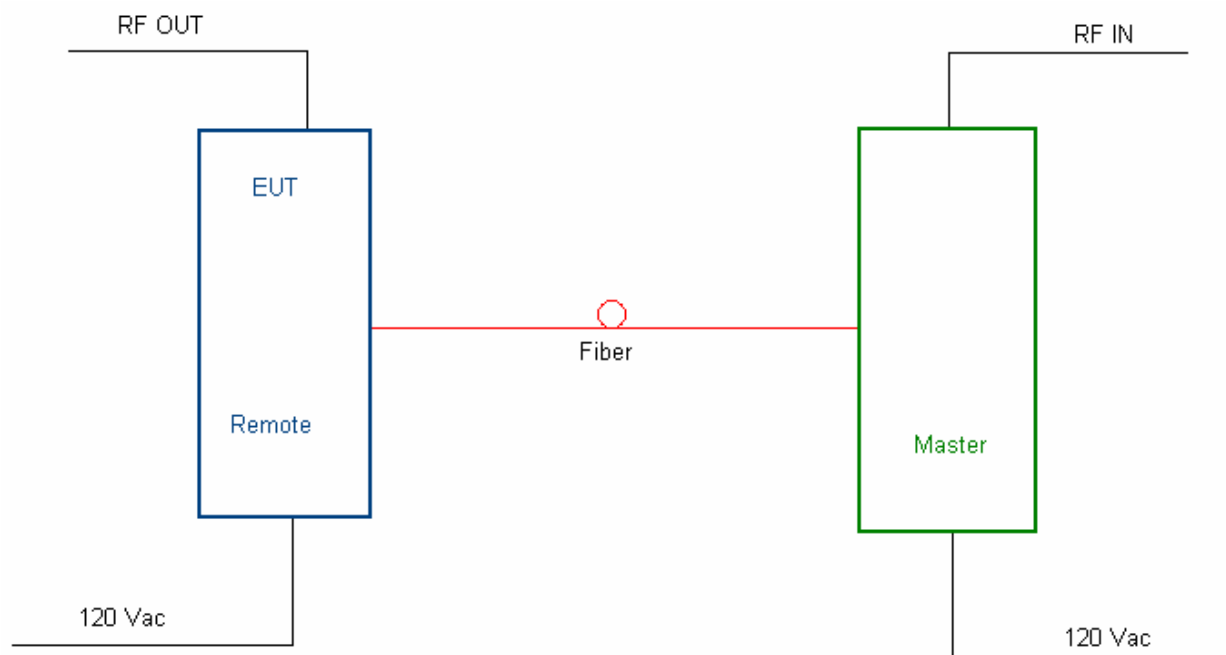
EQUIPMENT: **ION-M85/19P****Section 2. General Equipment Specification**

Supply Voltage Input:	120 Vac				
Frequency Bands: Downlink:	☒	Block A :	1930 – 1945 MHz		
	☒	Block D :	1945 – 1950 MHz		
	☒	Block B :	1950 – 1965 MHz		
	☒	Block E :	1965 – 1970 MHz		
	☒	Block F :	1970 – 1975 MHz		
	☒	Block C :	1975 – 1990 MHz		
Frequency Bands: Uplink:	☐	Block A :	1850 – 1865 MHz		
	☐	Block B :	1865 – 1870 MHz		
	☐	Block C :	1870 – 1885 MHz		
	☐	Block D :	1885 – 1890 MHz		
	☐	Block E :	1890 – 1895 MHz		
	☐	Block F :	1895 – 1910 MHz		
Type of Modulation and Designator:	CDMA (F9W)	GSM (GXW)	NADC (DXW)	W-CDMA (F9W)	EDGE (G7W)
	☒	☒	☒	☒	☒
System Gain:	40 dB				
Output Impedance:	50 ohms				
RF Output (Rated): Uplink	$\frac{\text{Na}}{\text{na}} \frac{\text{W}}{\text{dBm}}$				
RF Output (Rated): Downlink	$\frac{20}{43} \frac{\text{W}}{\text{dBm}}$				
Frequency Translation:	F1-F1	F1-F2	N/A		
	☒	☐	☐		
Band Selection:	Software	Duplexer	Fullband		
	☐	☐	☒		

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****Section 3. RF Power Output**

NAME OF TEST: RF Power Output	PARA. NO.: 24.232
TESTED BY: David Light	DATE: 27 June 2007

Test Results: Complies.

Measurement Data:

Direction	Frequency (MHz)	Modulation	RF Power (dBm)	RF Power (W)
Downlink Only	1930.2	GSM	42.96	19.77
	1960.0	GSM	43.07	20.28
	1989.8	GSM	43.11	20.30
	1930.2	EDGE	43.00	20.00
	1960.0	EDGE	43.37	21.73
	1989.8	EDGE	42.94	19.78
	1930.04	TDMA	42.99	20.00
	1960.0	TDMA	43.26	21.18
	1989.97	TDMA	43.01	20.00
	1931.25	CDMA	43.00	20.00
	1960.0	CDMA	43.33	21.58
	1988.78	CDMA	43.02	20.01
	1932.5	W-CDMA	42.15	16.41
	1960.0	W-CDMA	42.16	16.41
	1987.5	W-CDMA	42.07	16.11

Equipment Used: 1604-1064-1082-1036

Measurement Uncertainty: +/- 1.7 dBTemperature: 22 °CRelative Humidity: 48 %

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

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 24.238
TESTED BY: David Light	DATE: 27 June 2007

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1064-1604-10821036

Measurement Uncertainty: 1X10⁻⁷ ppm

Temperature: 22 °C

Relative Humidity: 48 %

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

Test Data – Occupied Bandwidth

CDMA/EV-DO

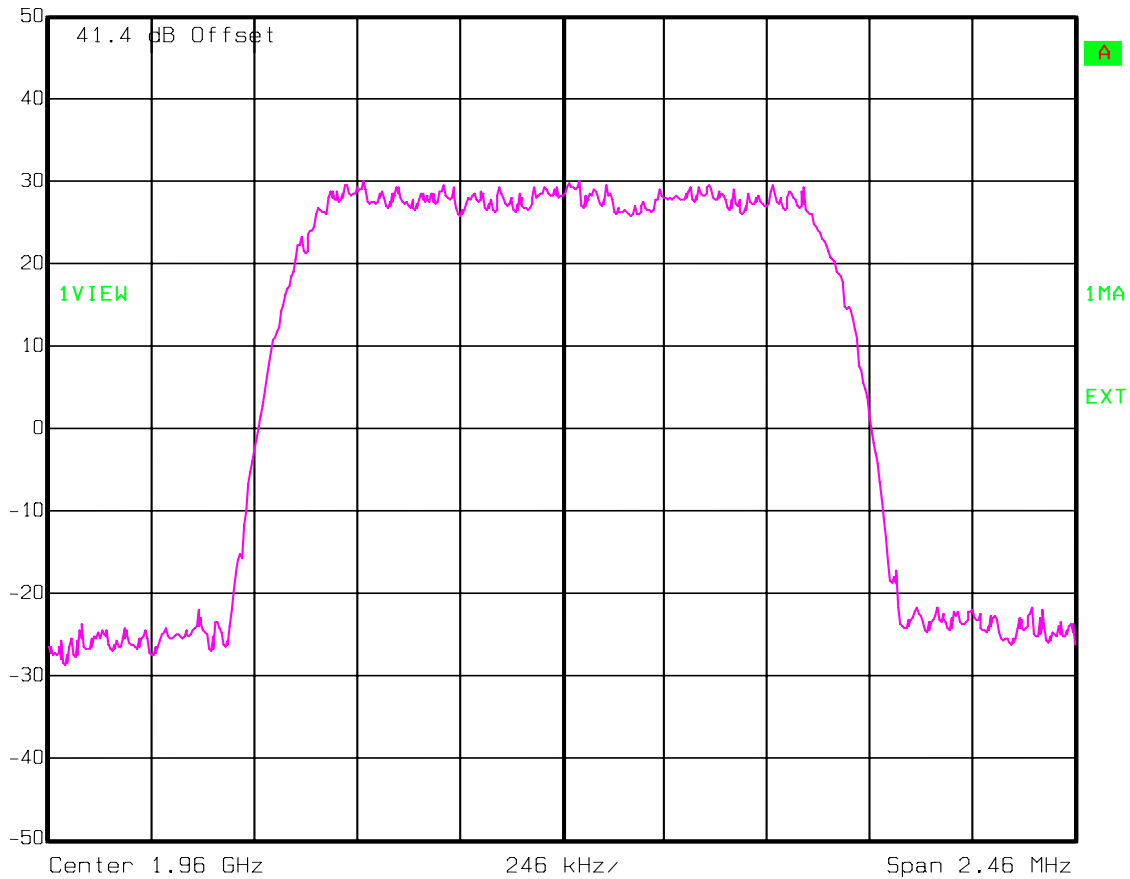
OBW

OUTPUT



Ref Lvl
50 dBm

RBW	30 kHz	RF Att	20 dB
VBW	30 kHz	Mixer	-10 dBm
SWT	7 ms	Unit	dBm



Date: 27.JUN.2007 14:03:24

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

Test Data – Occupied Bandwidth

CDMA/EV-DO

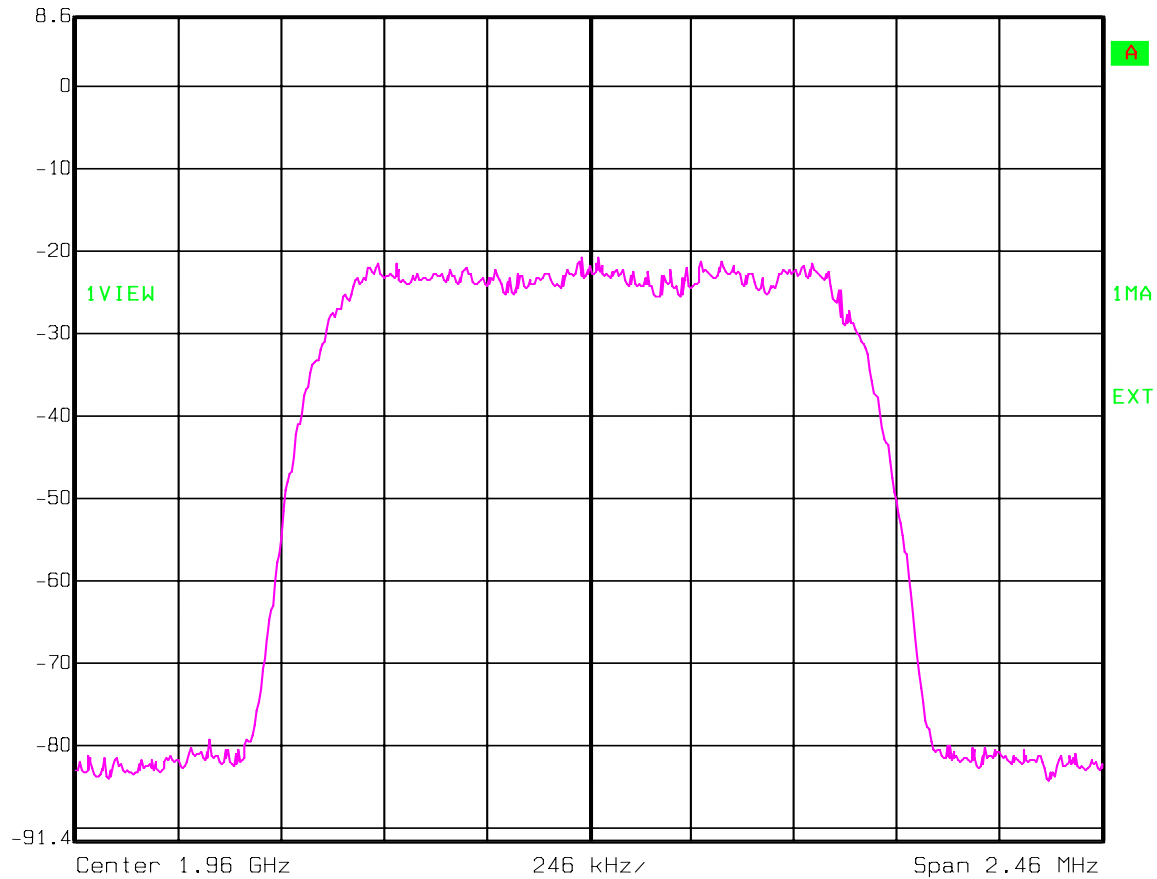
OBW

INPUT



Ref Lvl
8.6 dBm

RBW	30 kHz	RF Att	20 dB
VBW	30 kHz	Mixer	-10 dBm
SWT	7 ms	Unit	dBm



Date: 27.JUN.2007 14:06:57

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

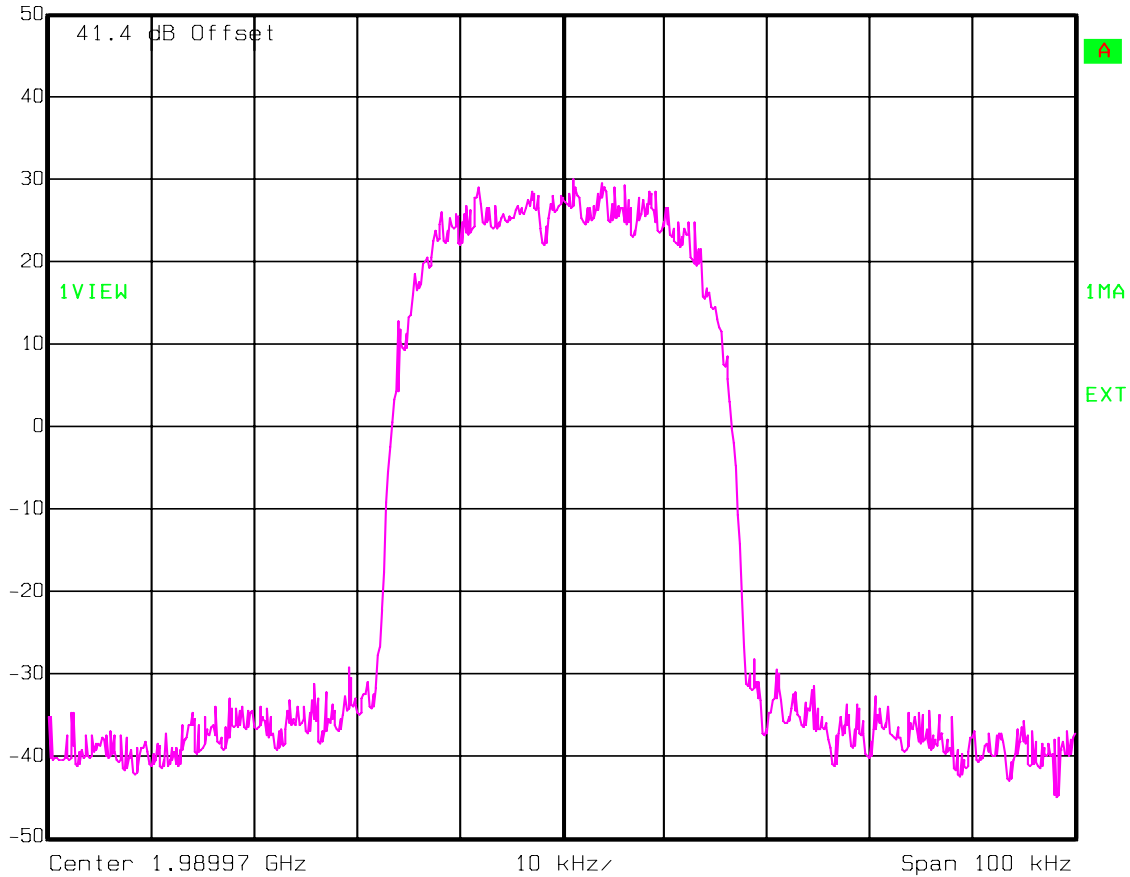
Test Data – Occupied Bandwidth

TDMA
OBW
OUTPUT



Ref Lvl
50 dBm

RBW	300 Hz	RF Att	30 dB
VBW	300 Hz		
SWT	5.6 s	Unit	dBm



Date: 27.JUN.2007 13:31:33

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

Test Data – Occupied Bandwidth

TDMA

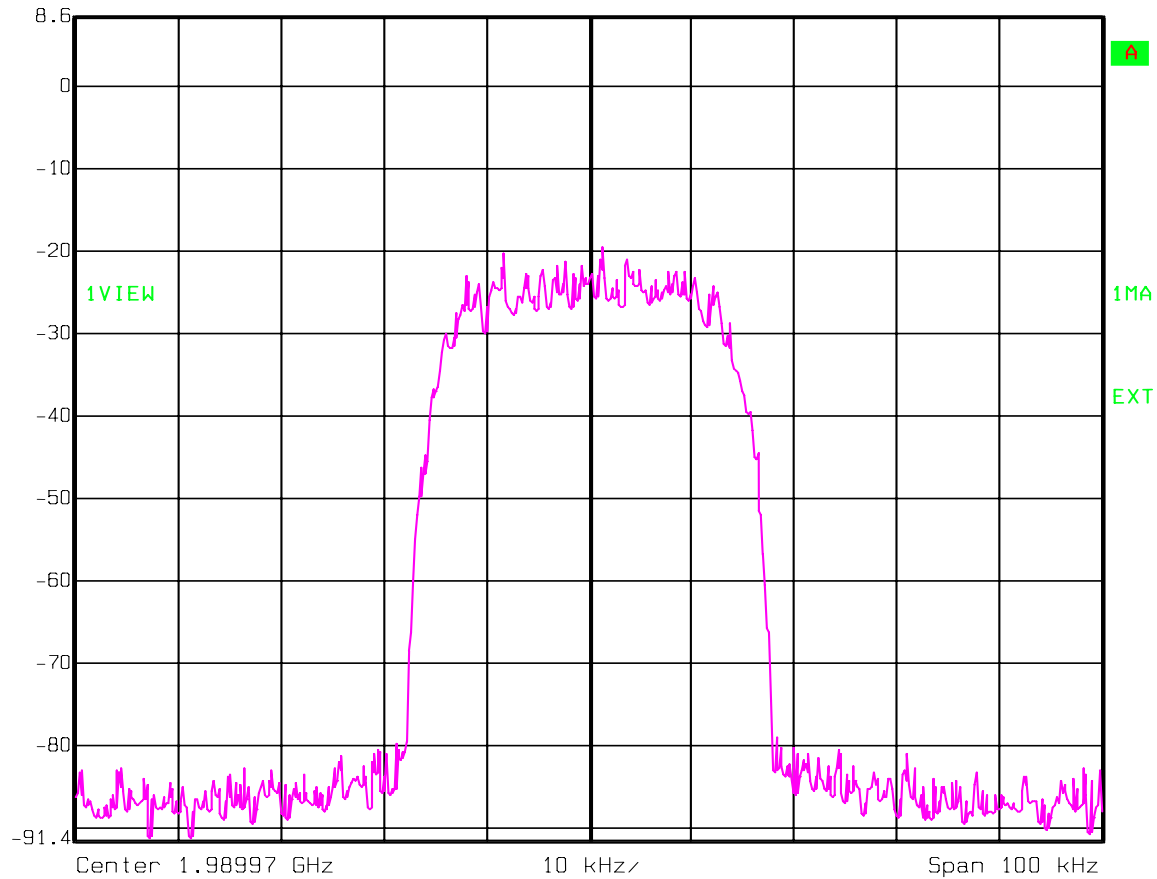
OBW

INPUT



Ref Lvl
8.6 dBm

RBW	300 Hz	RF Att	30 dB
VBW	300 Hz		
SWT	5.6 s	Unit	dBm



Date: 27.JUN.2007 13:32:29

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

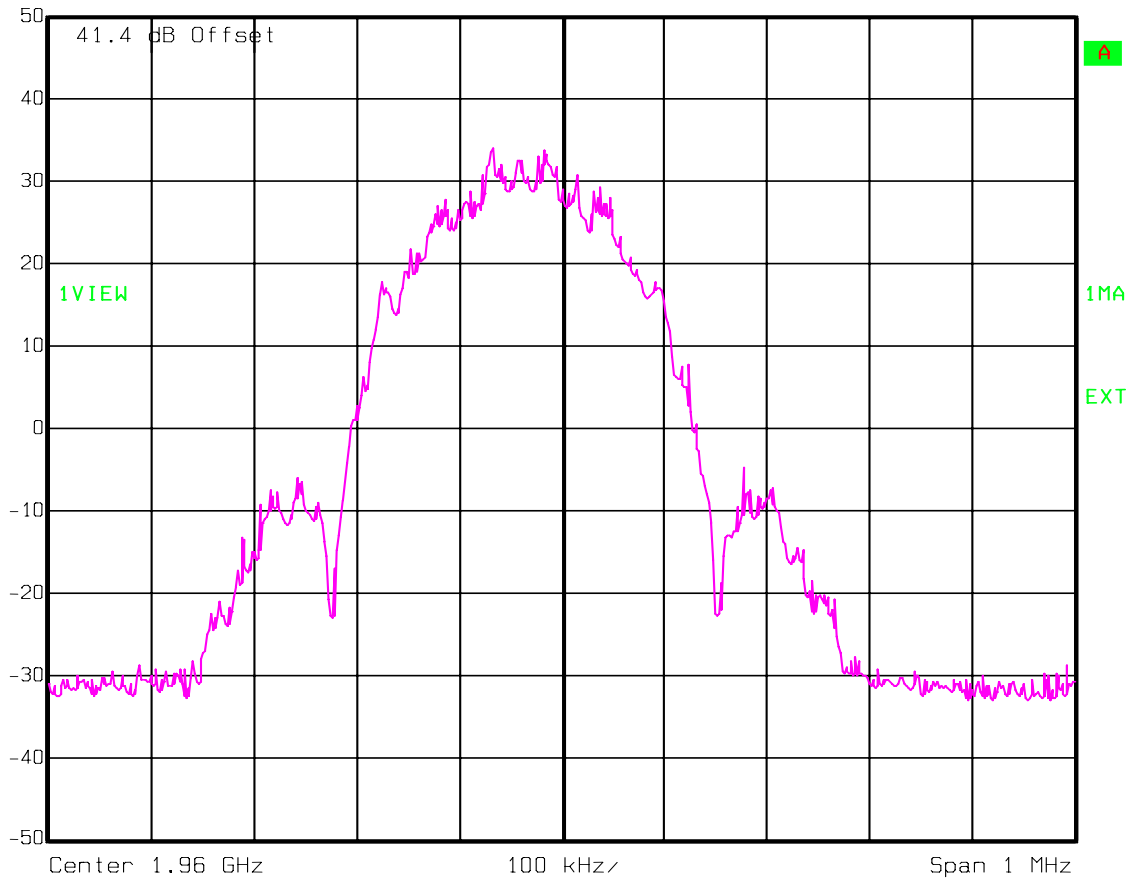
Test Data – Occupied Bandwidth

EDGE
OBW
OUTPUT



Ref Lvl
50 dBm

RBW 3 kHz RF Att 30 dB
VBW 3 kHz
SWT 280 ms Unit dBm



Date: 27.JUN.2007 13:18:11

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

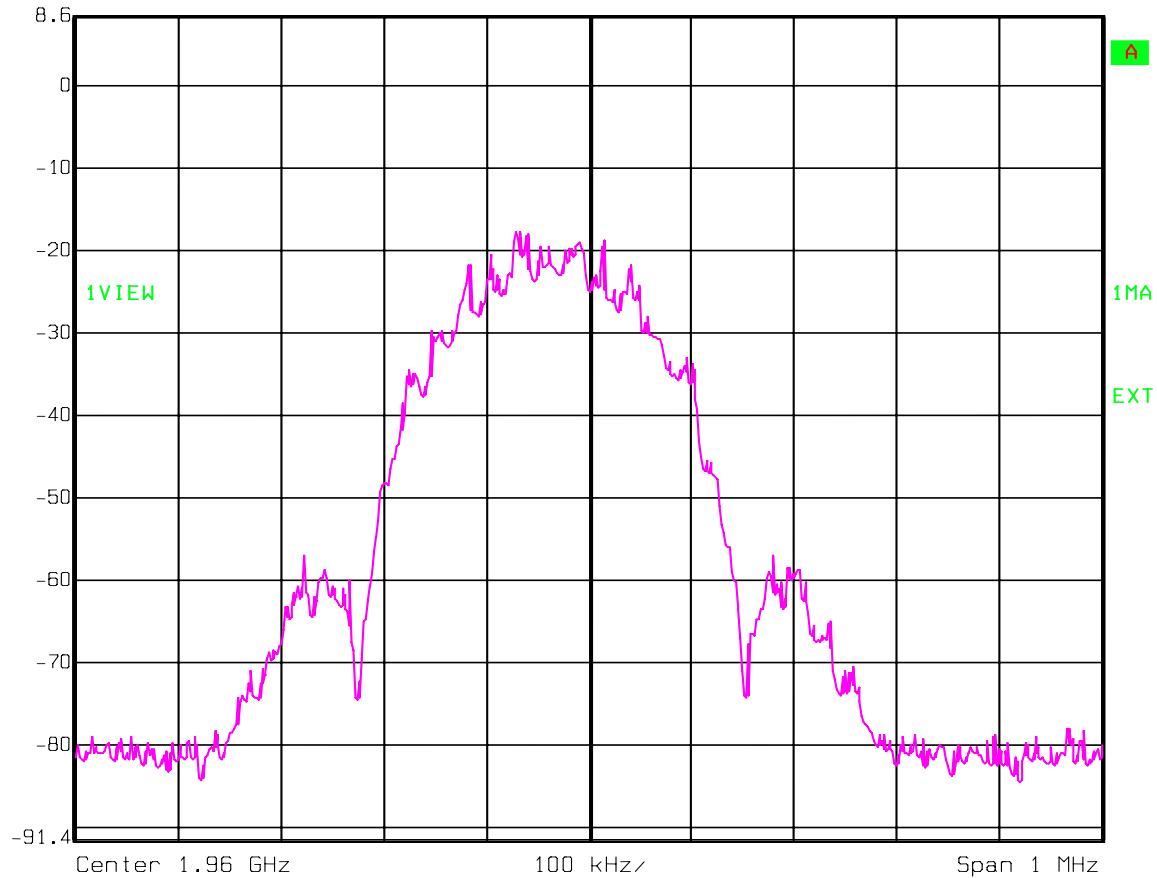
Test Data – Occupied Bandwidth

EDGE - Input



Ref Lvl
8.6 dBm

RBW	3 kHz	RF Att	30 dB
VBW	3 kHz		
SWT	280 ms	Unit	dBm

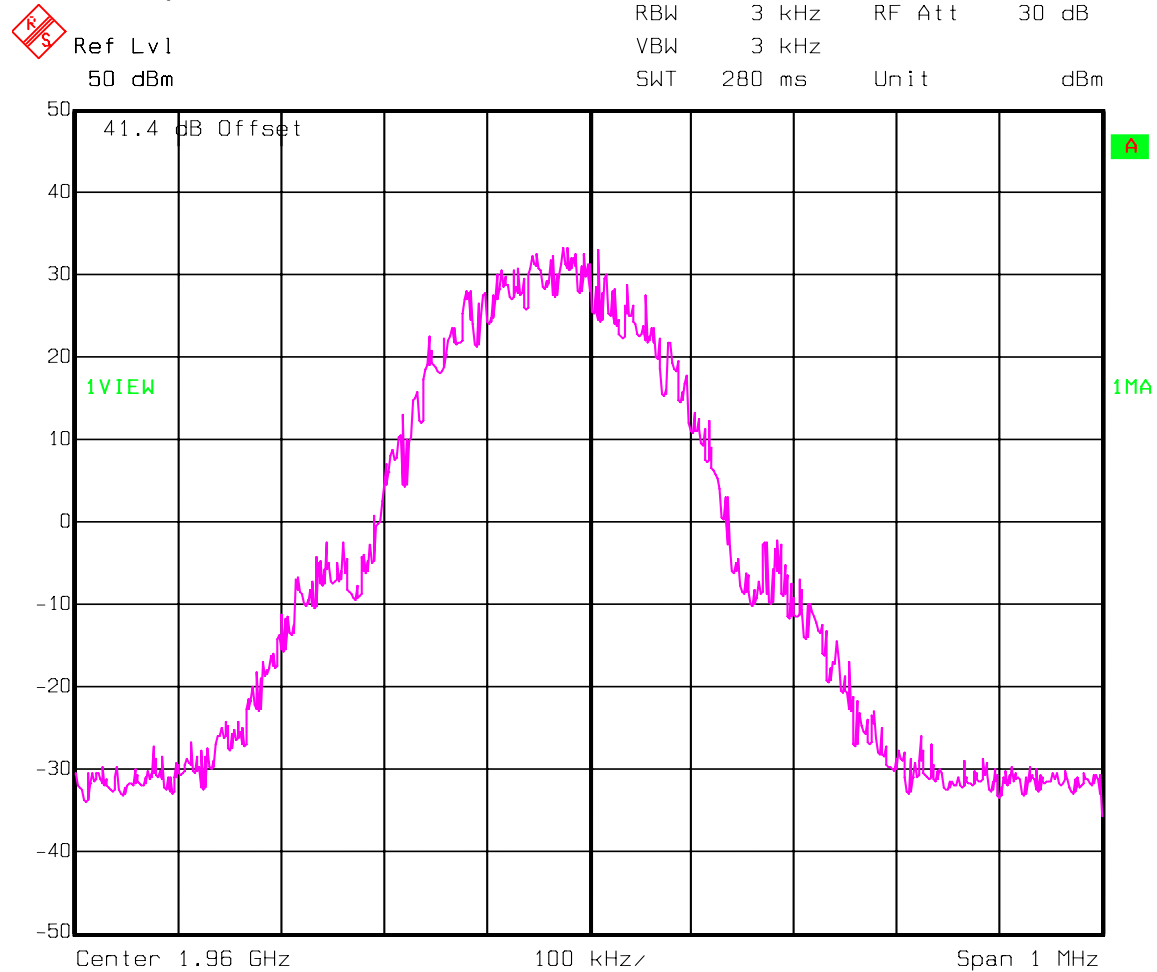


Date: 27.JUN.2007 13:19:08

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

Test Data – Occupied Bandwidth

GSM - Output



Date: 27.JUN.2007 12:45:51

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

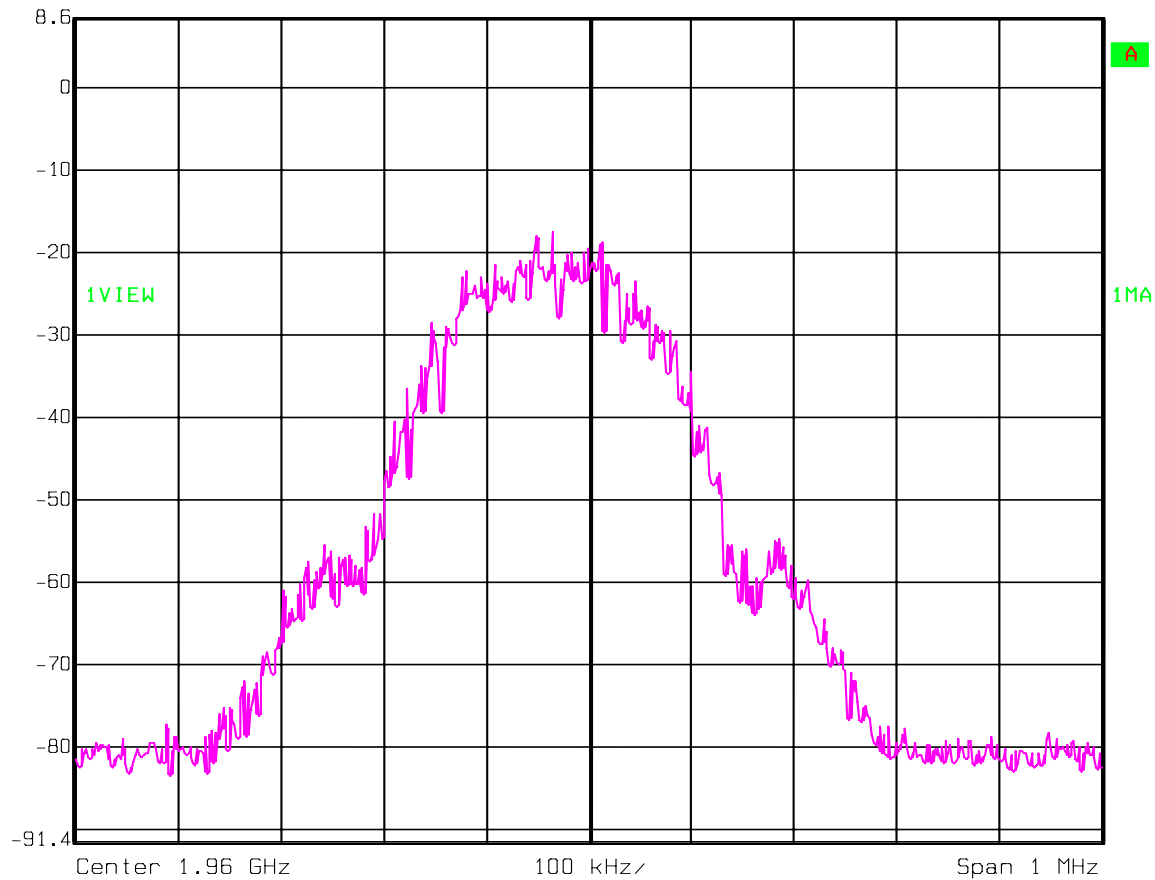
Test Data – Occupied Bandwidth

GSM - Input



Ref Lvl
8.6 dBm

RBW	3 kHz	RF Att	30 dB
VBW	3 kHz		
SWT	280 ms	Unit	dBm



Date: 27.JUN.2007 12:46:50

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

Test Data – Occupied Bandwidth

WCDMA/HSDPA

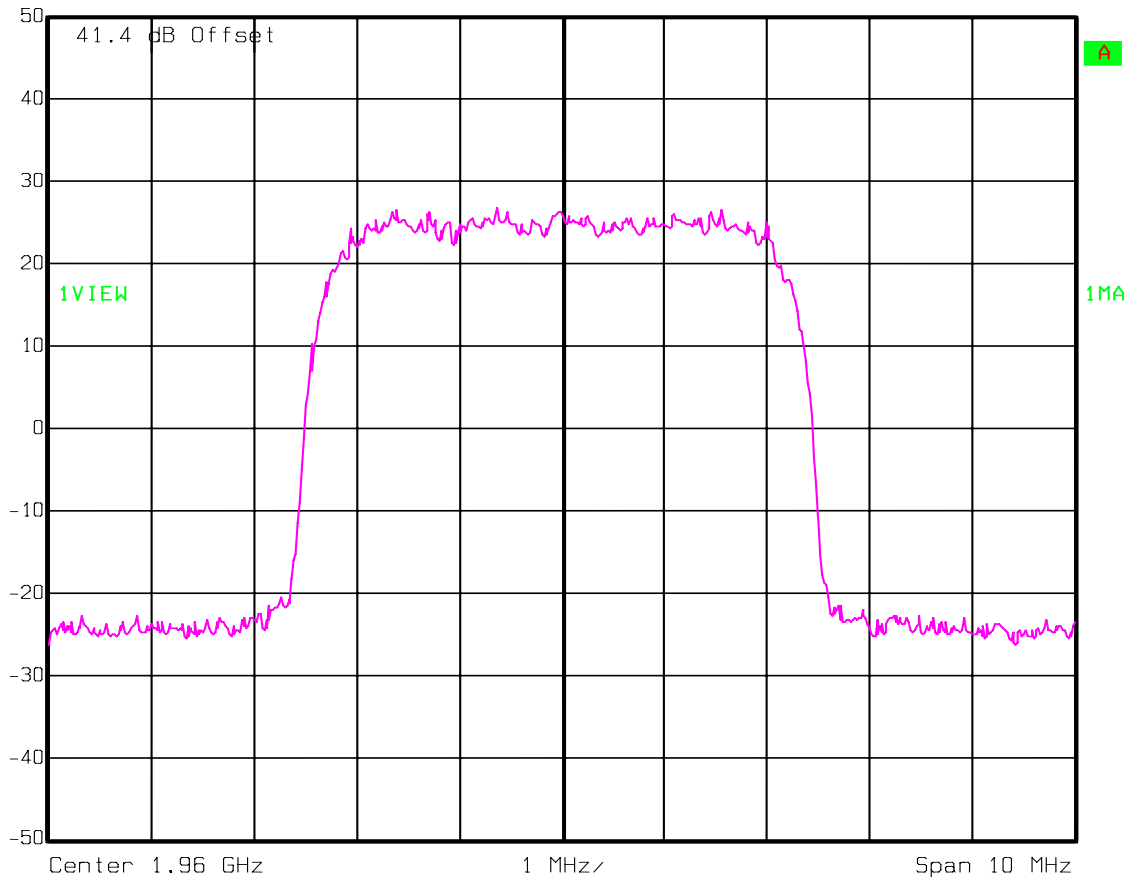
OBW

OUTPUT



Ref Lvl
50 dBm

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



Date: 27.JUN.2007 15:17:40

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

Test Data – Occupied Bandwidth

WCDMA/HSDPA

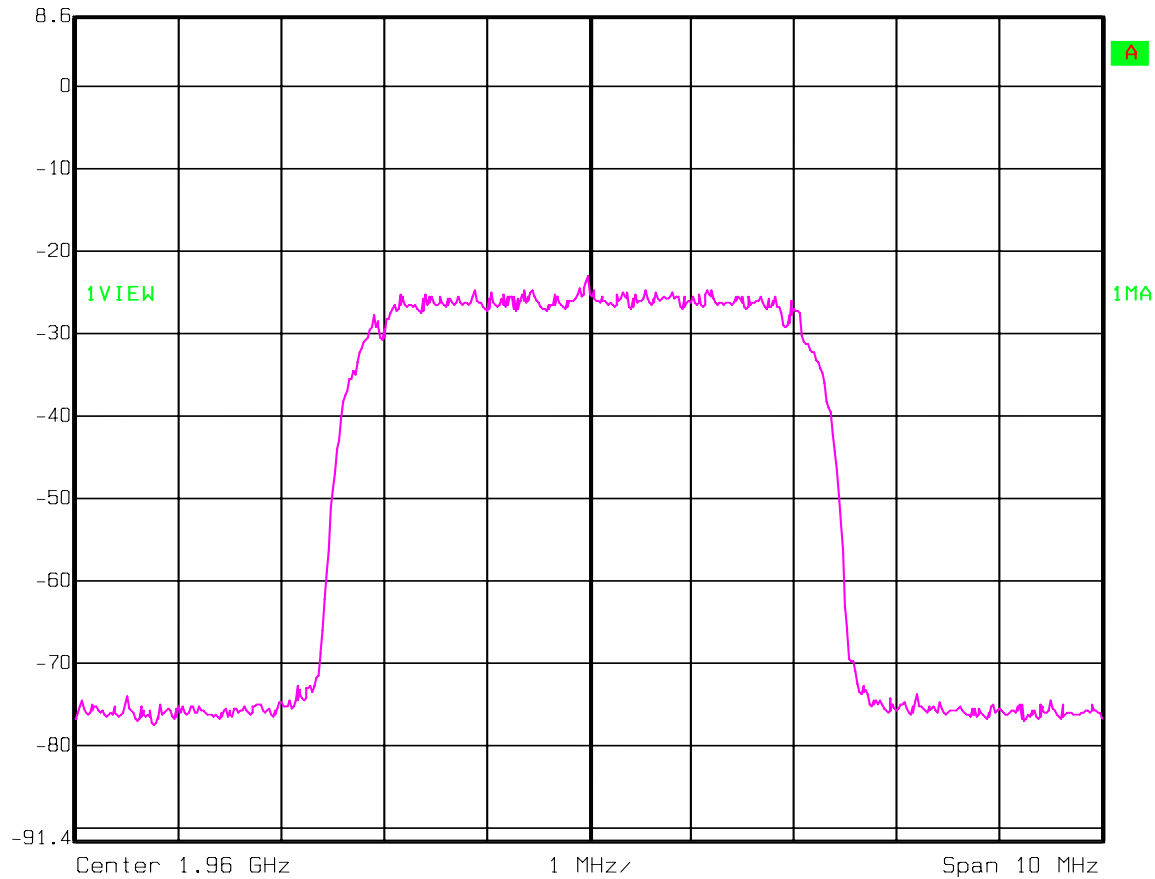
OBW

INPUT



Ref Lvl
8.6 dBm

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



Date: 27.JUN.2007 15:18:56

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 24.238
TESTED BY: David Light	DATE: 27 June 2007

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1064-1604-1082-1036

Measurement Uncertainty: +/- 1.7 dB

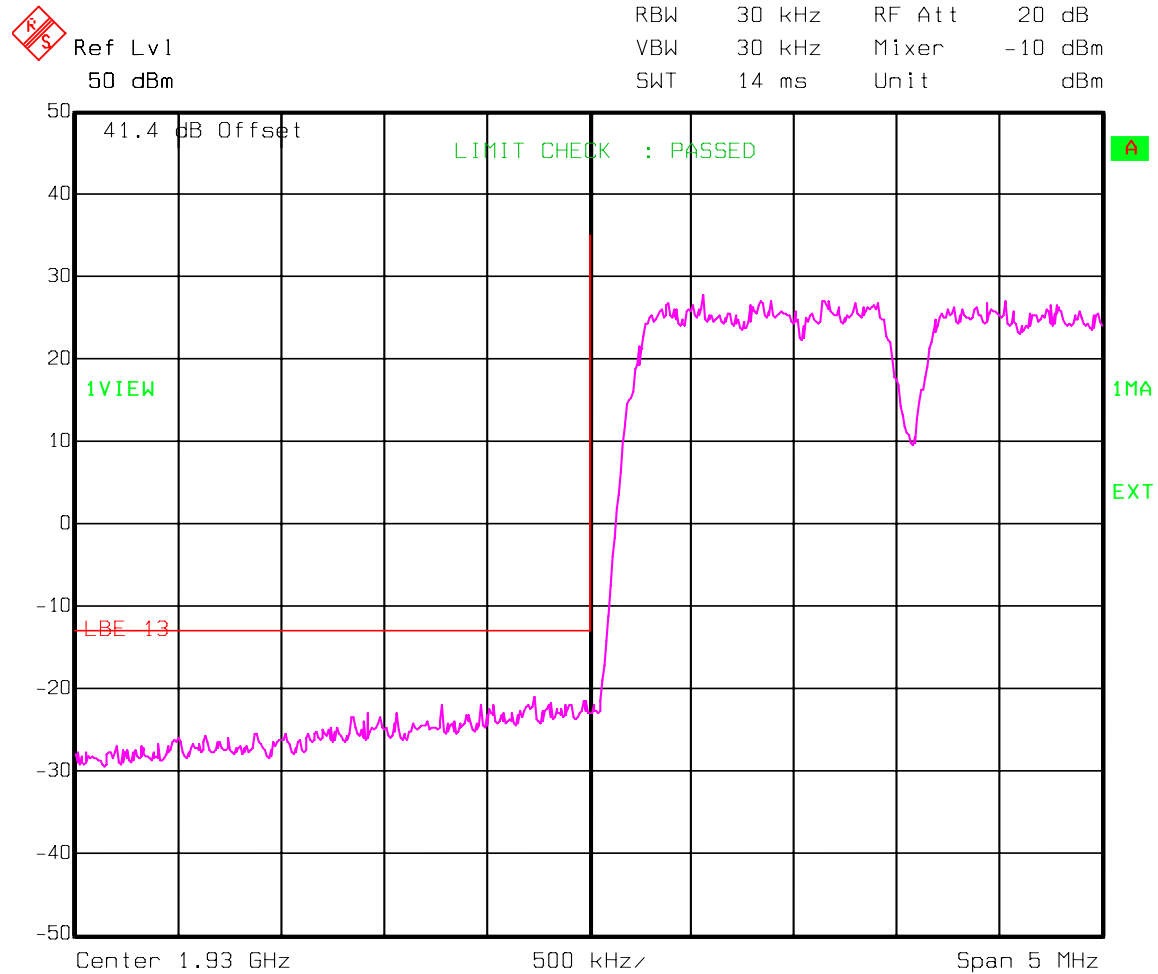
Temperature: 22 °C

Relative Humidity: 48 %

EQUIPMENT: **ION-M85/19P****Test Data – Spurious Emissions at Antenna Terminals**

CDMA/EV-DO

LOW BANDEDGE INTERMOD

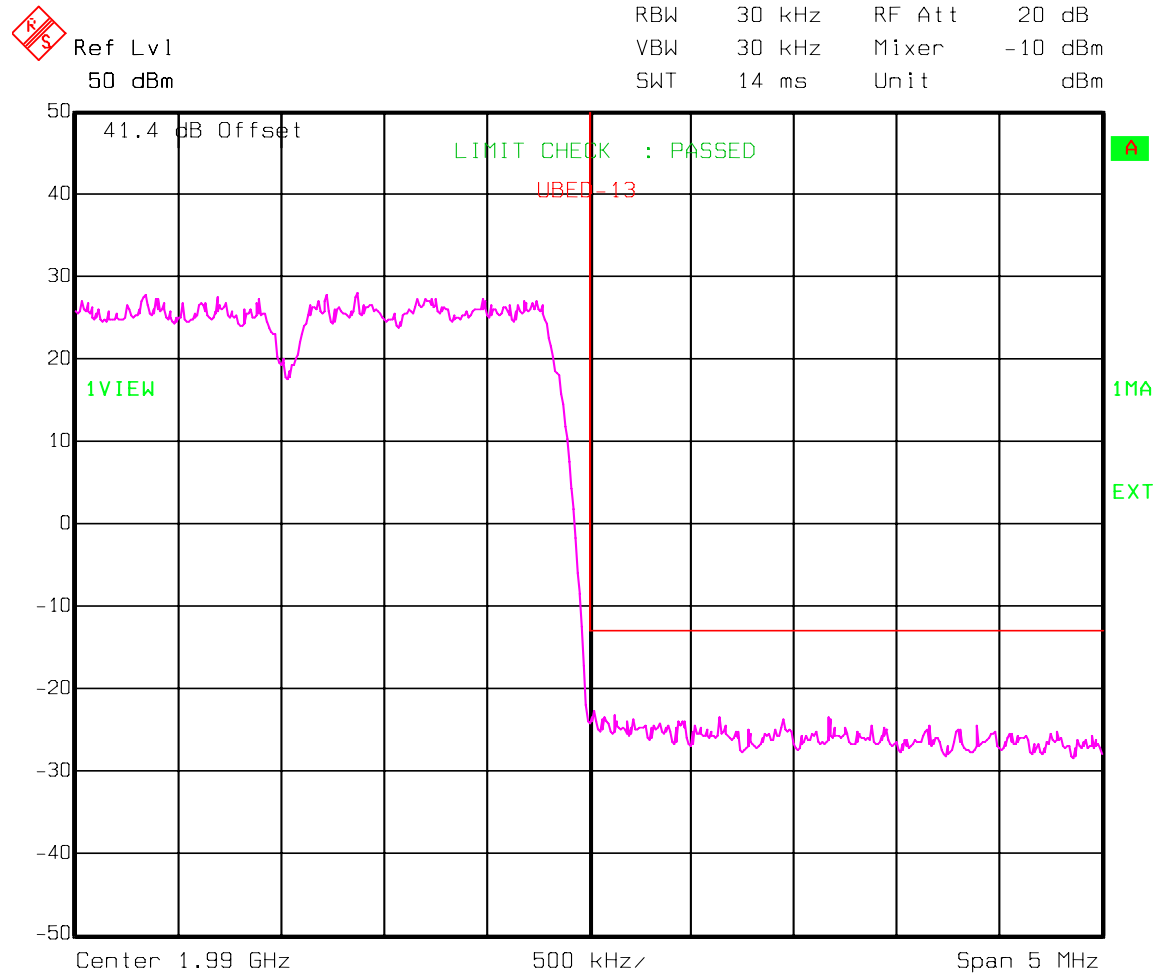


Date: 27.JUN.2007 14:41:39

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

Test Data – Spurious Emissions at Antenna Terminals

CDMA/EV-DO
HIGH BAND EDGE

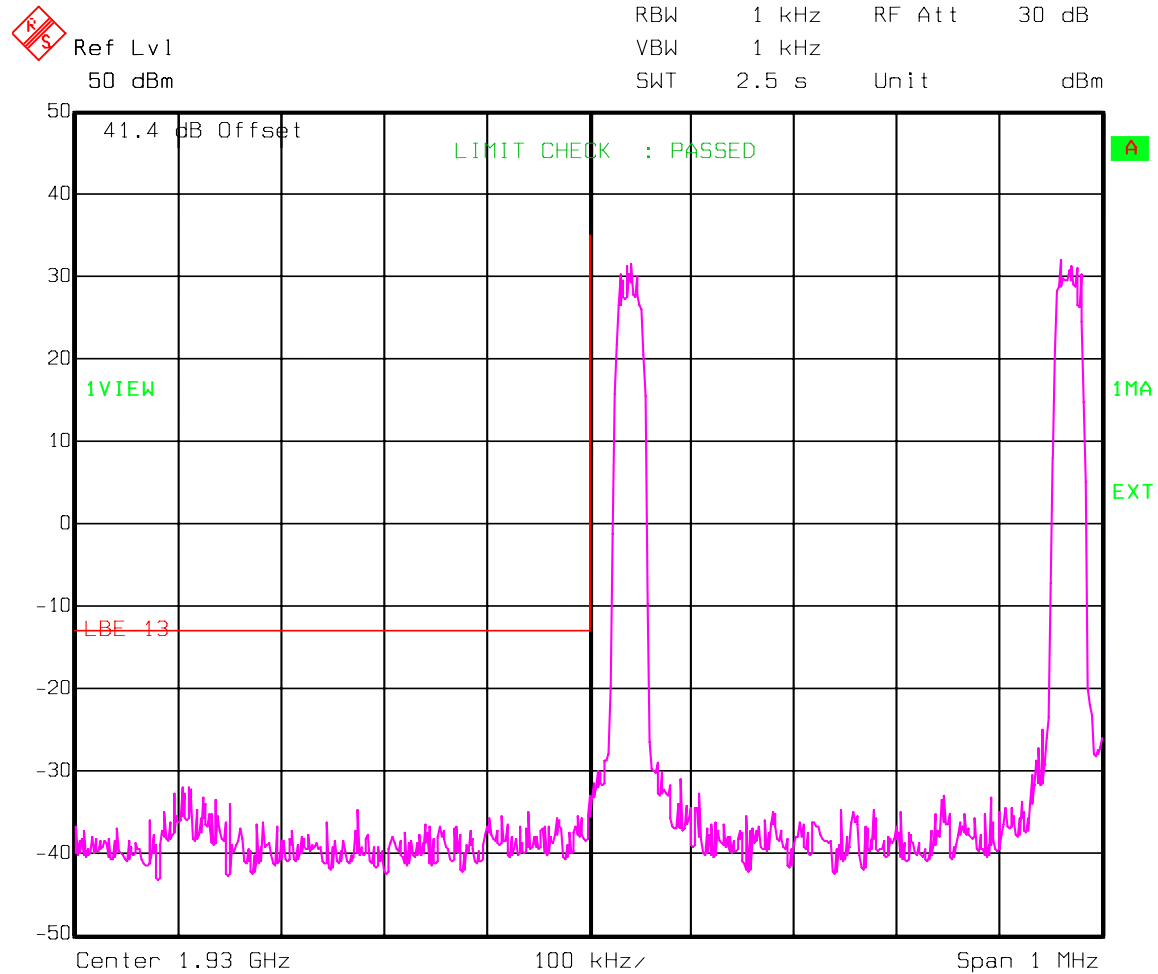


Date: 27.JUN.2007 14:36:25

EQUIPMENT: **ION-M85/19P****Test Data – Spurious Emissions at Antenna Terminals**

TDMA

LOW BANDEDGE INTERMOD

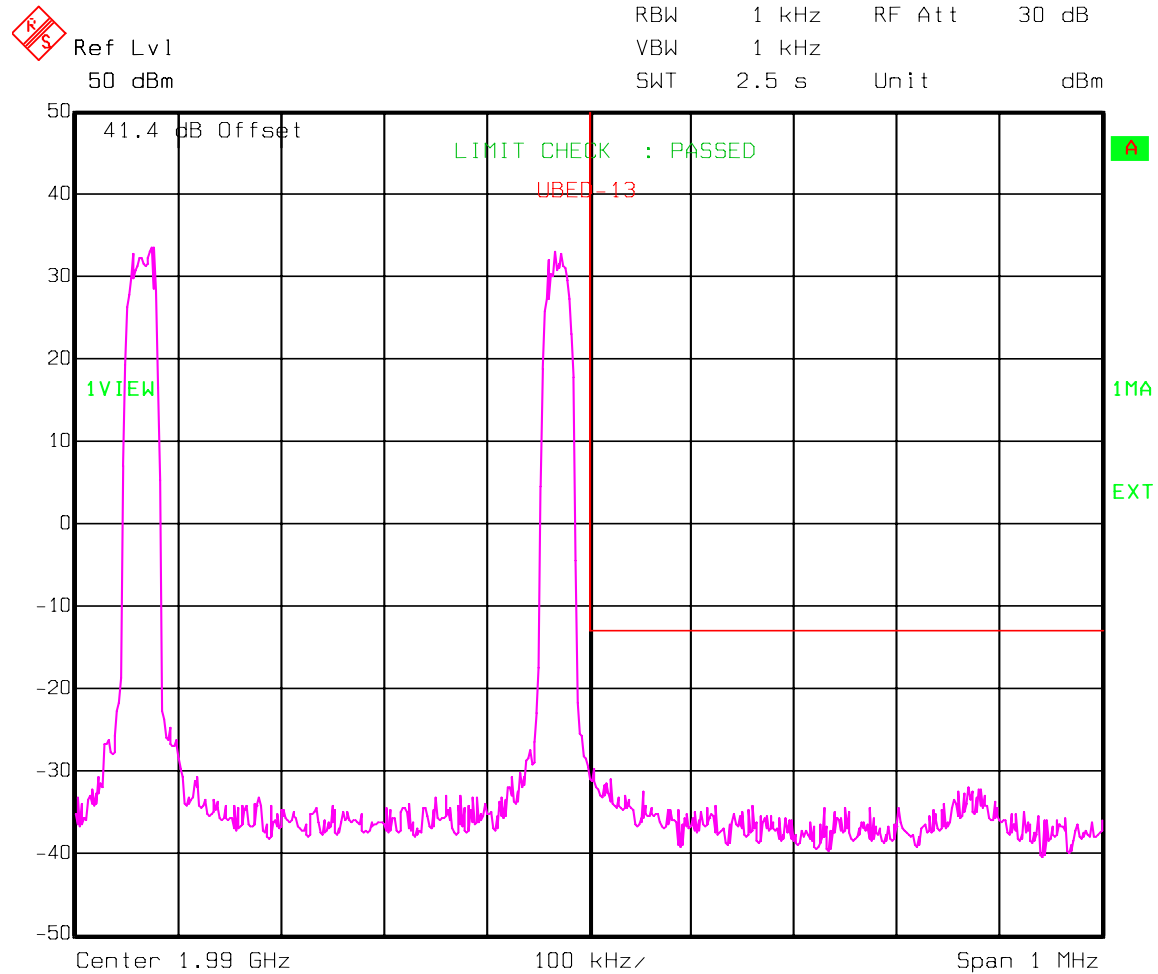


Date: 27.JUN.2007 13:35:20

EQUIPMENT: **ION-M85/19P****Test Data – Spurious Emissions at Antenna Terminals**

TDMA

HIGH BAND EDGE



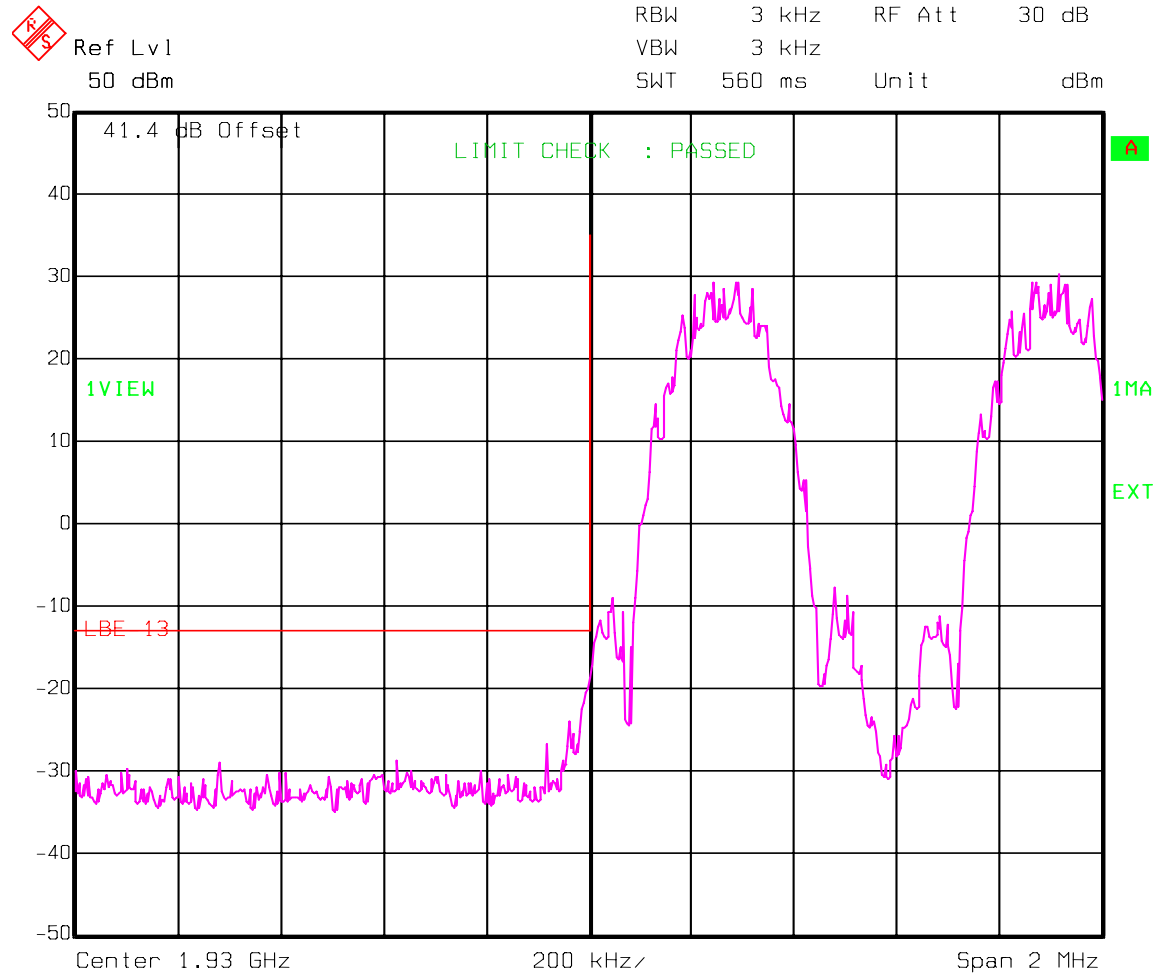
Date: 27.JUN.2007 13:37:27

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

Test Data – Spurious Emissions at Antenna Terminals

EDGE

LOW BANDEDGE INTERMOD

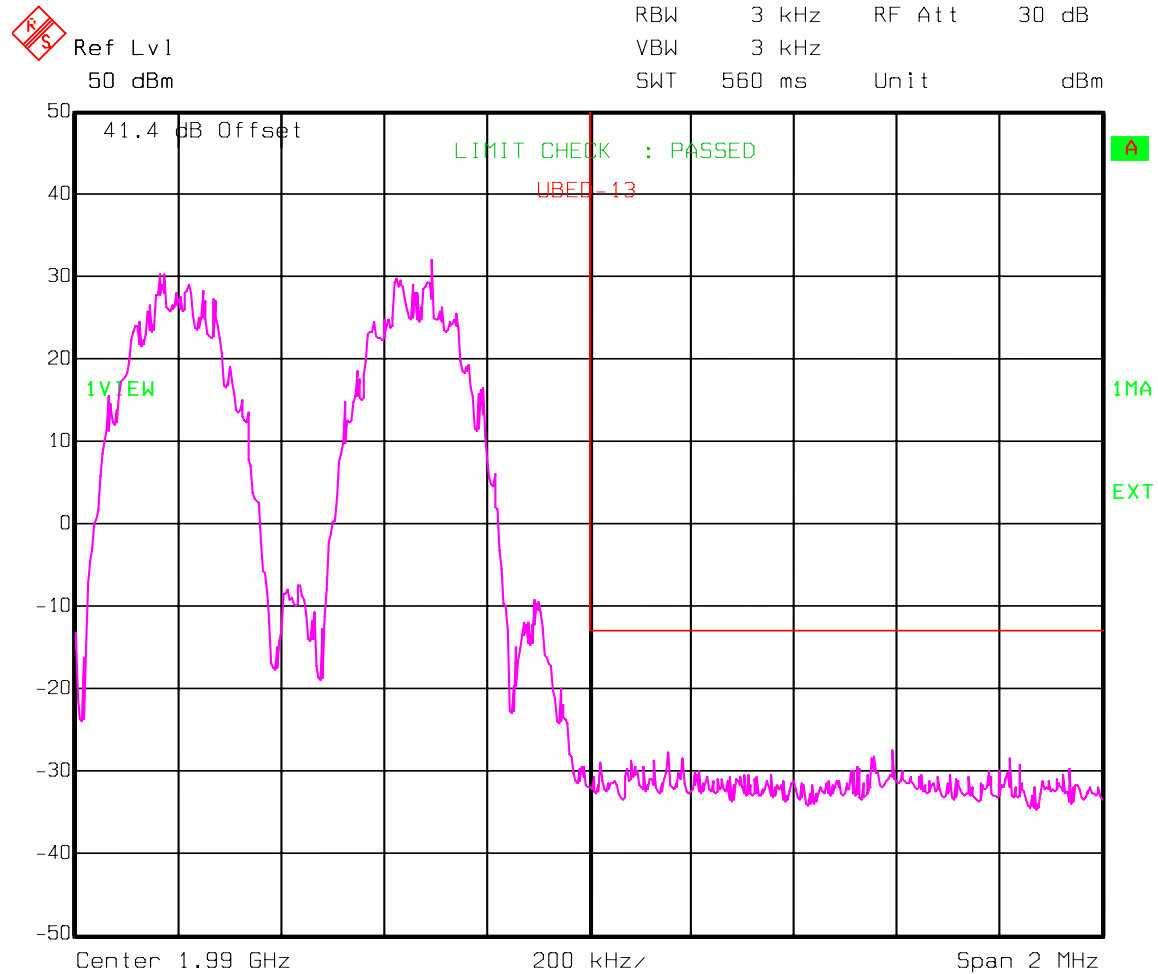


Date: 27.JUN.2007 13:21:03

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

Test Data – Spurious Emissions at Antenna Terminals

EDGE
HIGH BAND EDGE



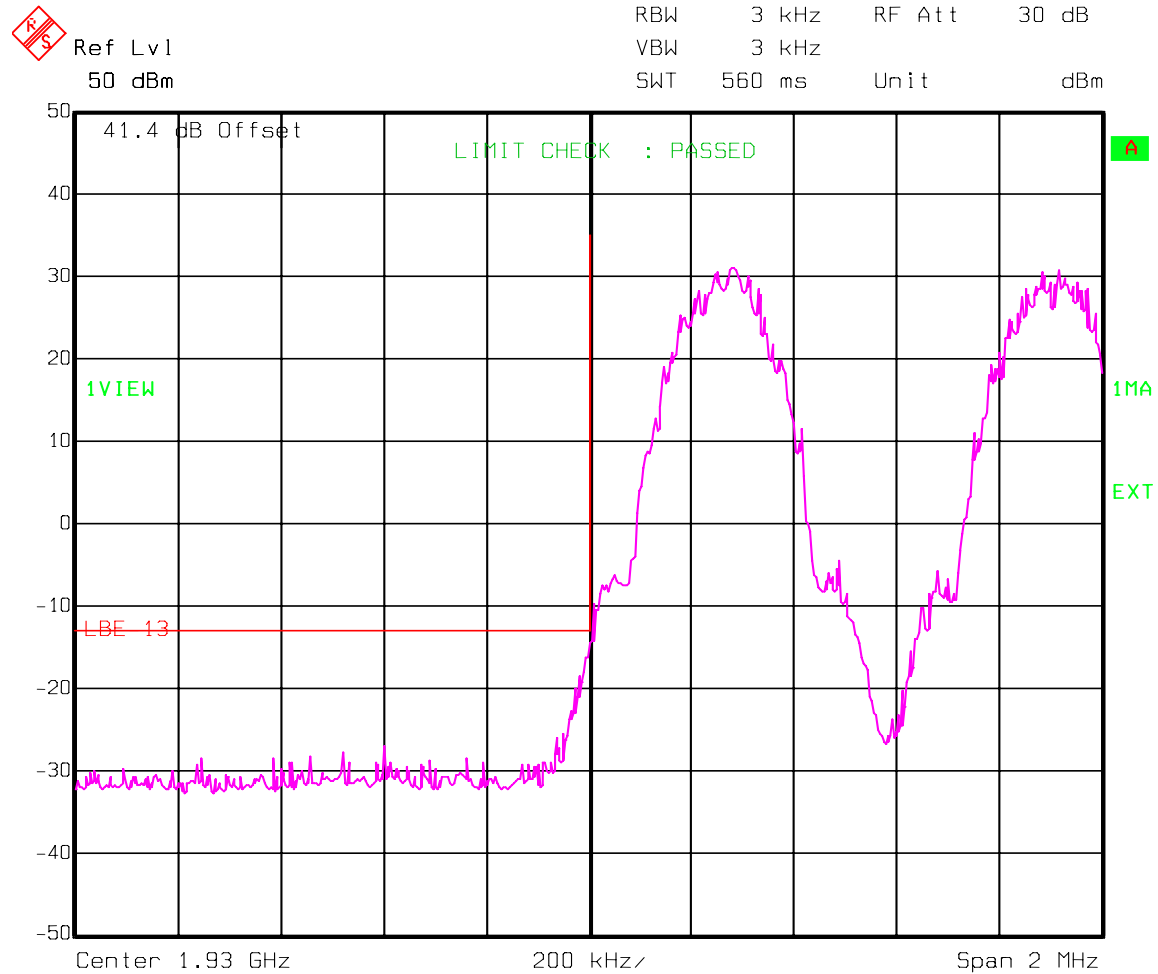
Date: 27.JUN.2007 13:22:00

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

Test Data – Spurious Emissions at Antenna Terminals

GSM

LOW BANDEDGE INTERMOD

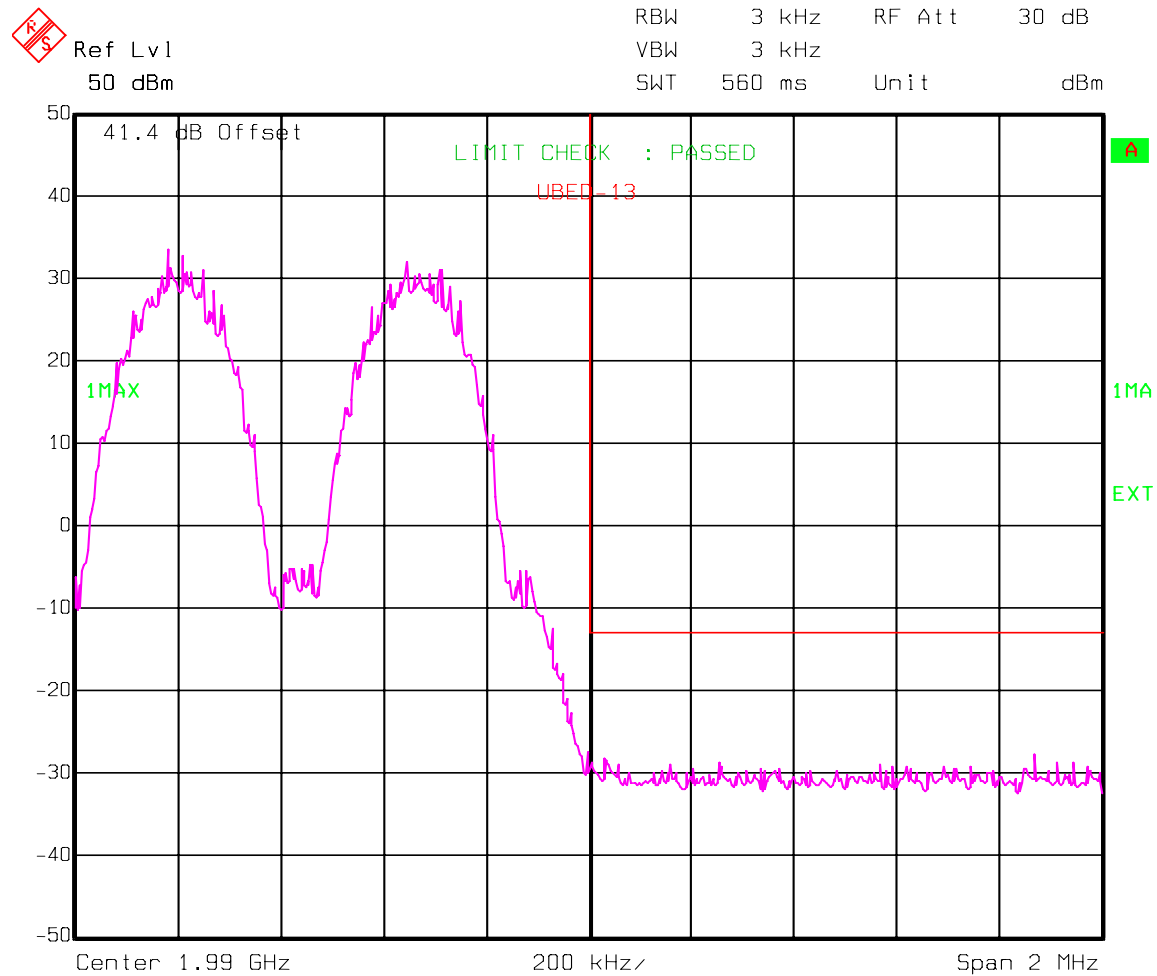


Date: 27.JUN.2007 12:53:27

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

Test Data – Spurious Emissions at Antenna Terminals

GSM
HIGH BAND EDGE



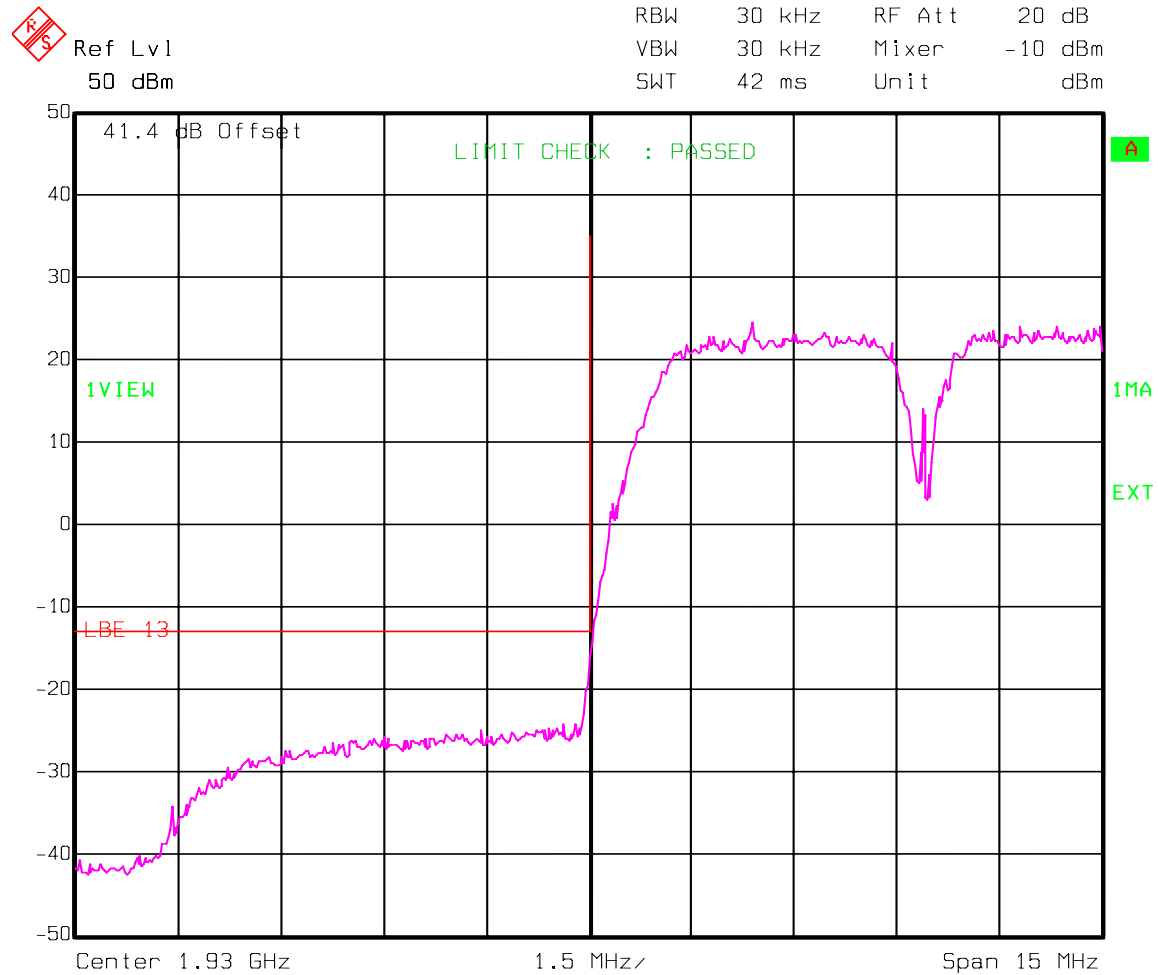
Date: 27.JUN.2007 12:54:57

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

Test Data – Spurious Emissions at Antenna Terminals

WCDMA/HSDPA

LOW BANDEDGE INTERMOD

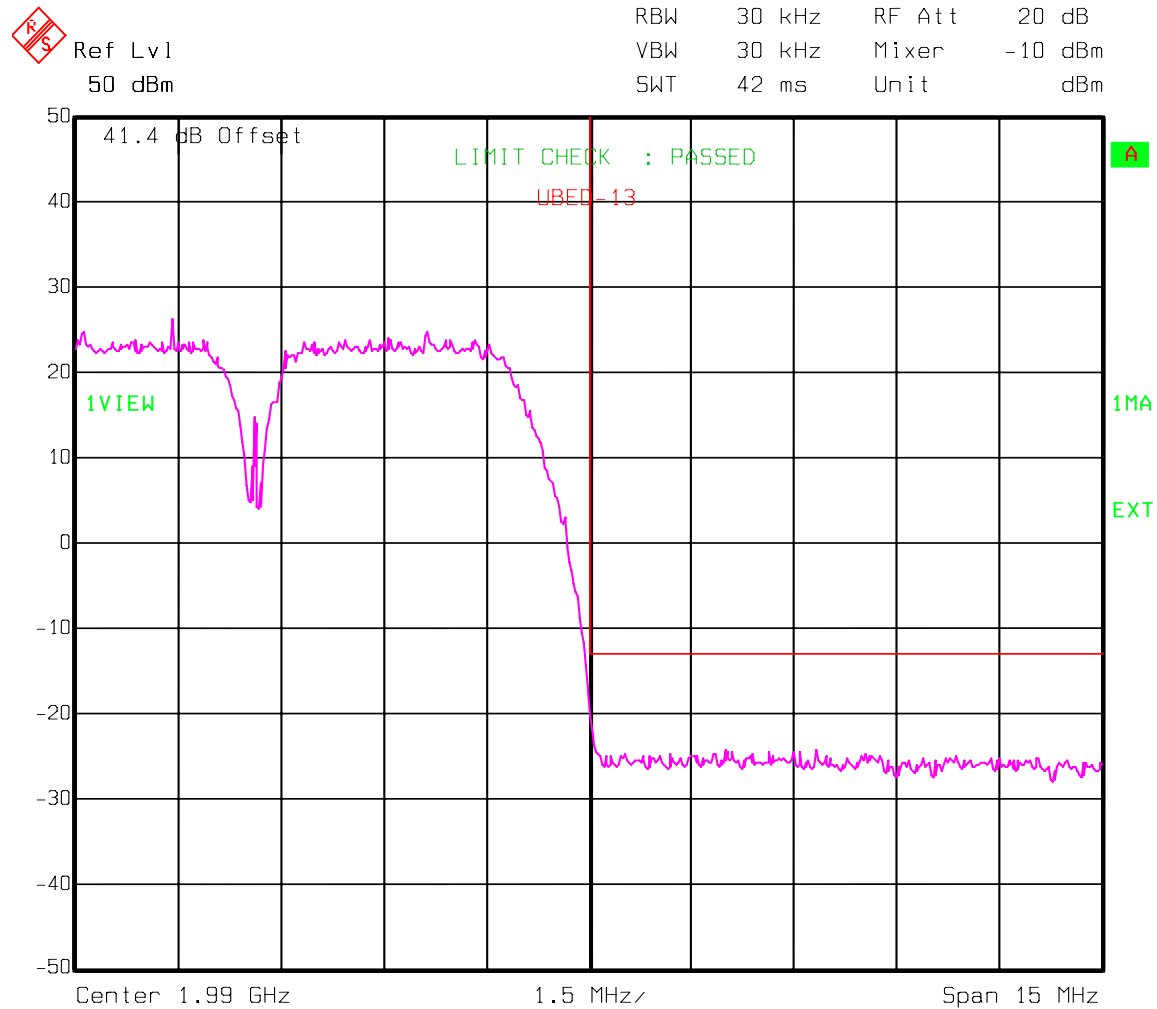


Date: 27.JUN.2007 15:05:10

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

Test Data – Spurious Emissions at Antenna Terminals

WCDMA/HSDPA
HIGH BAND EDGE

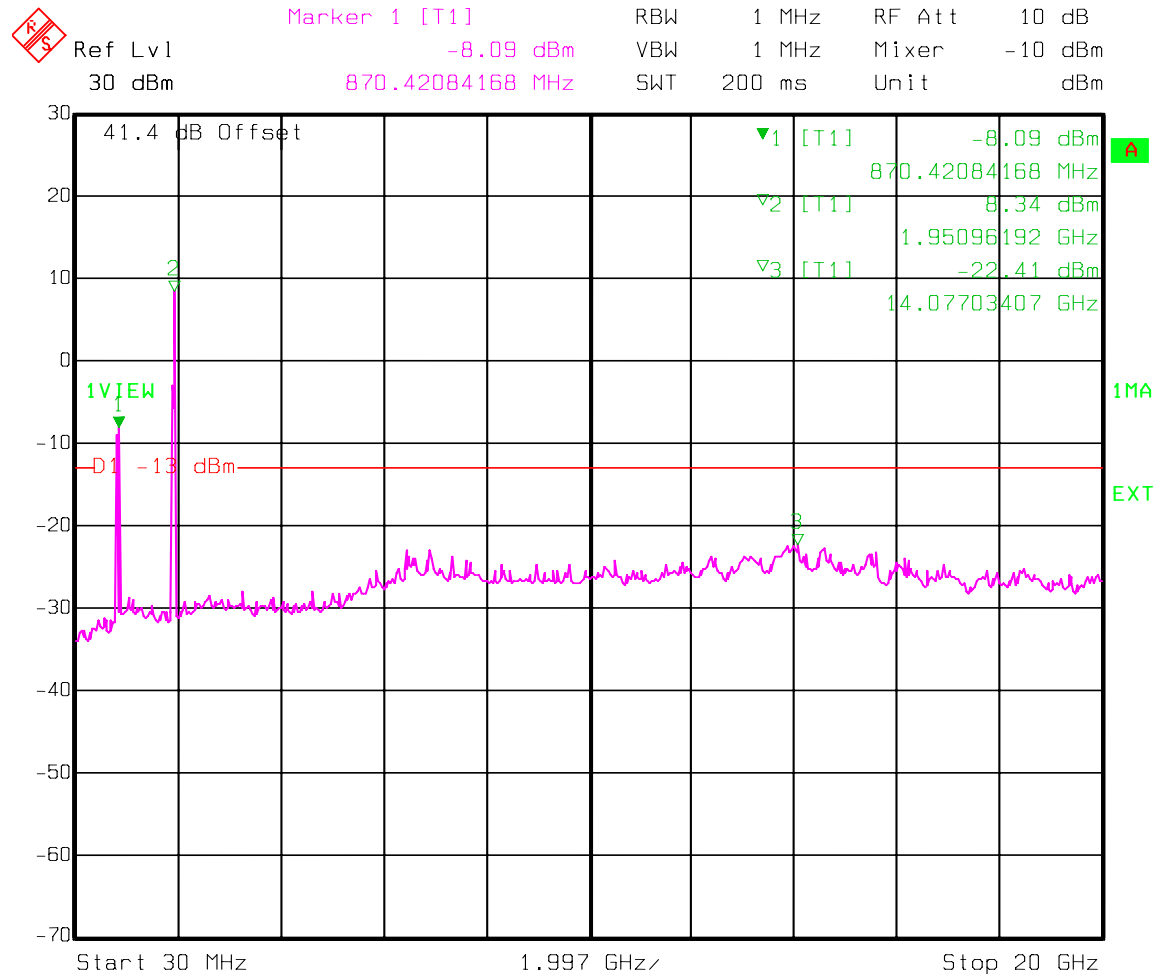


Date: 27.JUN.2007 15:06:16

EQUIPMENT: **ION-M85/19P****Test Data – Spurious Emissions at Antenna Terminals**

CDMA/EV-DO

SPURS



Date: 27.JUN.2007 14:29:29

Marker 1 indicates amplifier response in 850 MHz cell band

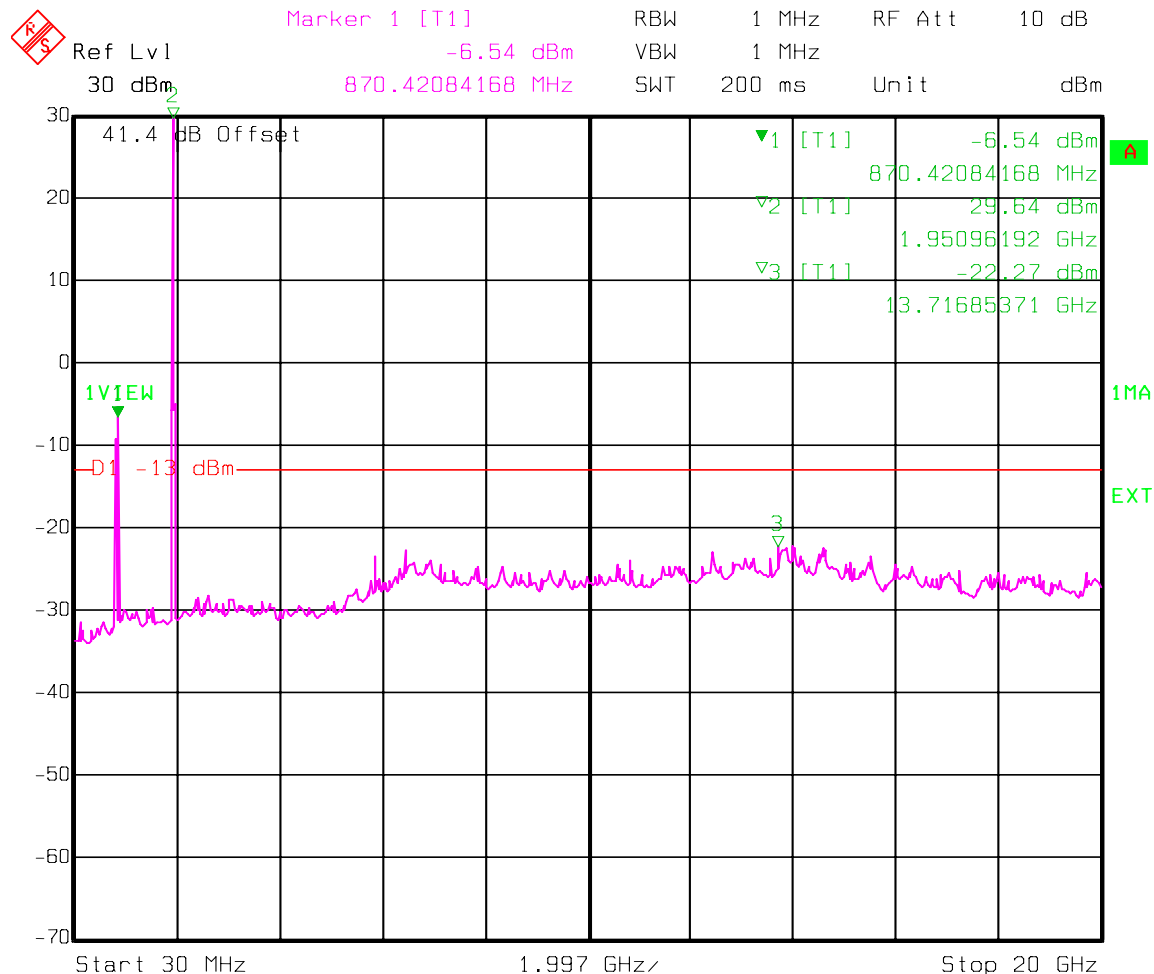
Marker 2 indicates carrier

Marker 3 indicates highest emission

EQUIPMENT: **ION-M85/19P****Test Data – Spurious Emissions at Antenna Terminals**

TDMA

SPURS

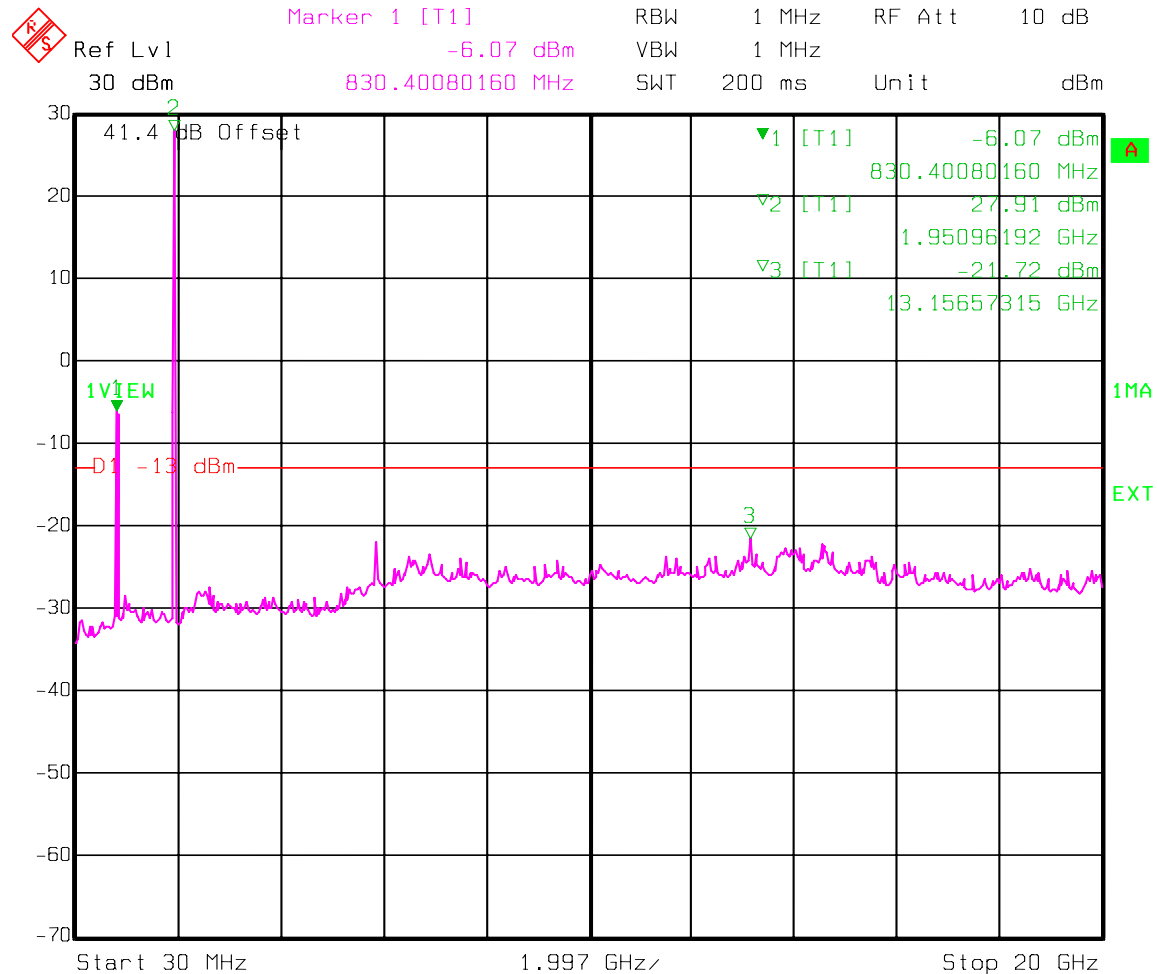


Date: 27.JUN.2007 13:39:39

Marker 1 indicates amplifier response in 850 MHz cell band

Marker 2 indicates carrier

Marker 3 indicates highest emission

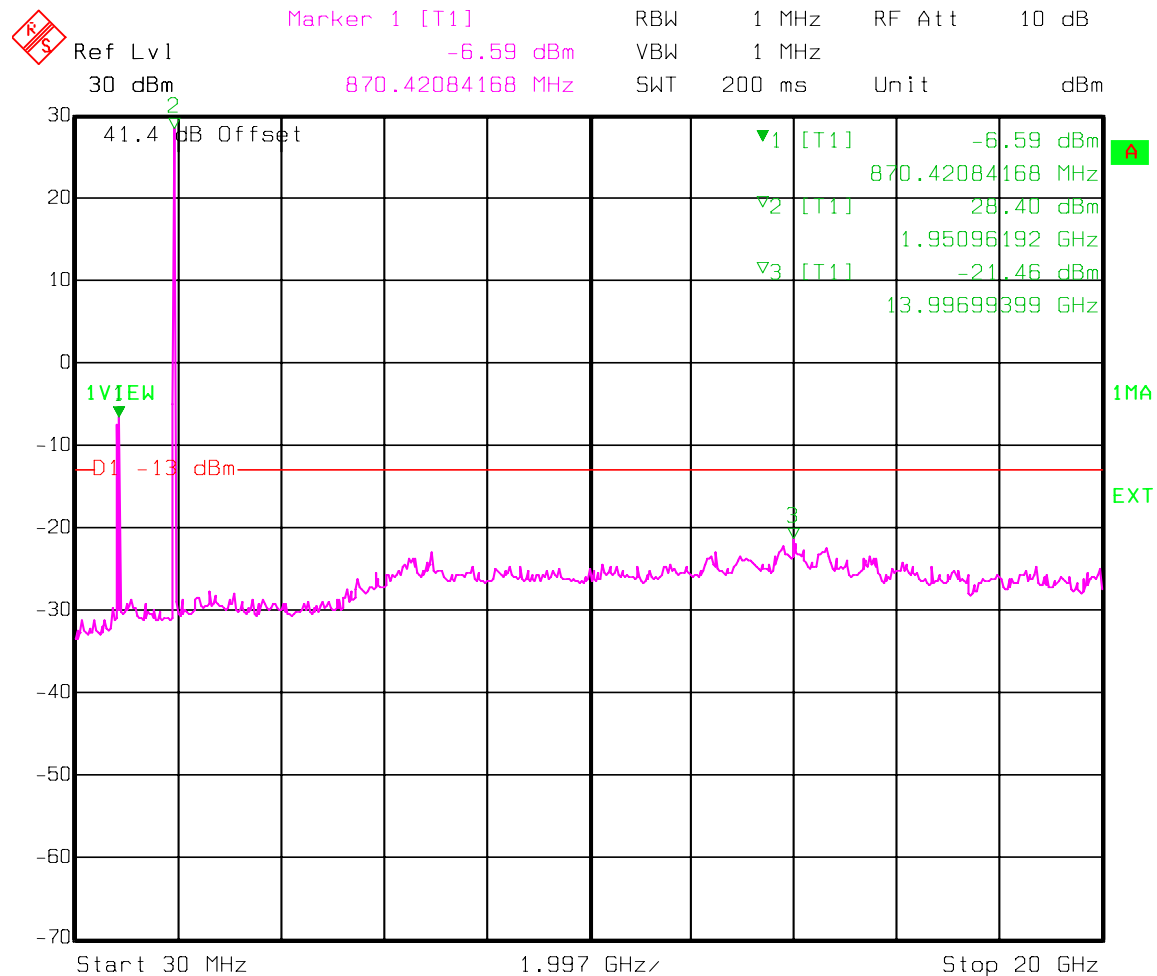
EQUIPMENT: **ION-M85/19P****Test Data – Spurious Emissions at Antenna Terminals**EDGE
SPURS

Date: 27.JUN.2007 13:24:02

Marker 1 indicates amplifier response in 850 MHz cell band

Marker 2 indicates carrier

Marker 3 indicates highest emission

EQUIPMENT: **ION-M85/19P****Test Data – Spurious Emissions at Antenna Terminals**GSM
SPURS

Date: 27.JUN.2007 13:11:11

Marker 1 indicates amplifier response in 850 MHz cell band

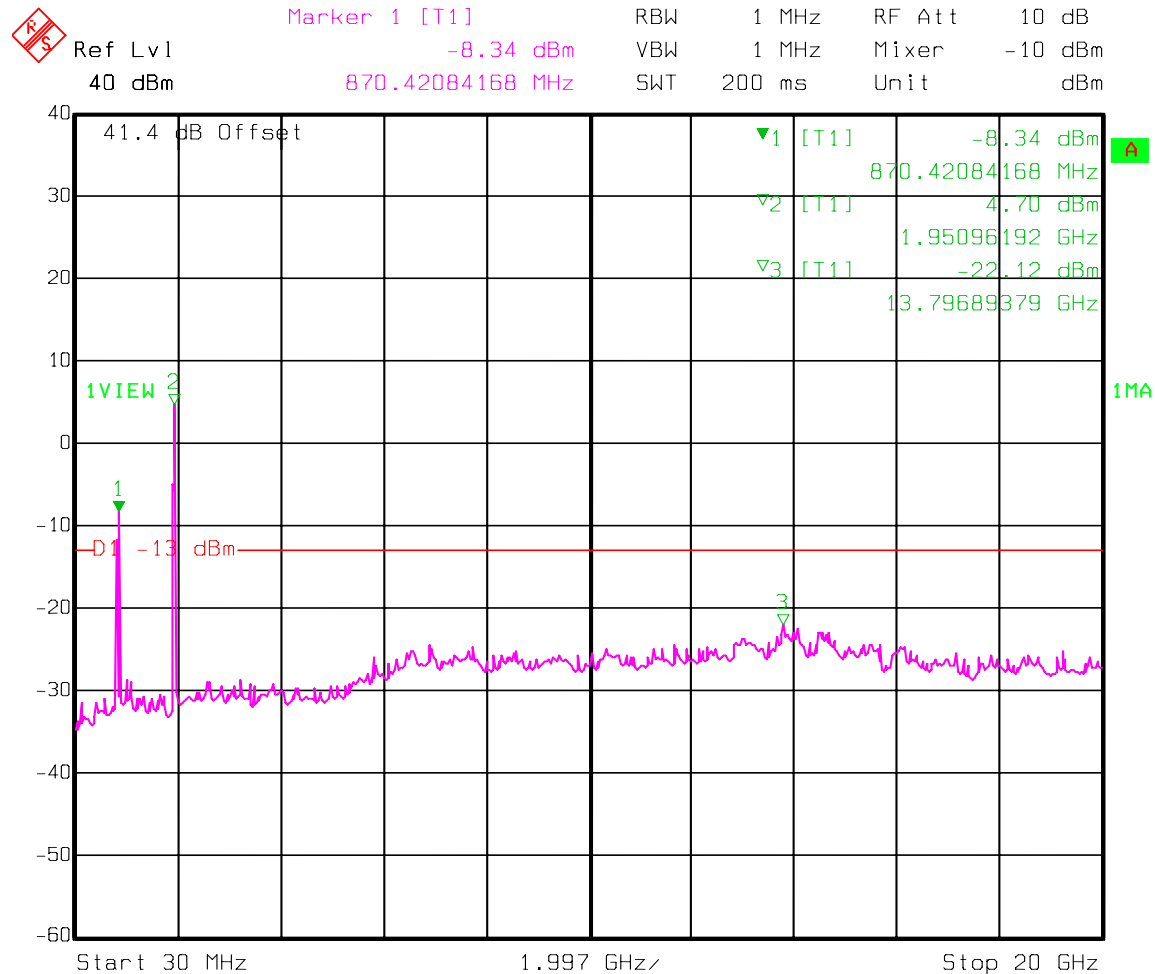
Marker 2 indicates carrier

Marker 3 indicates highest emission

EQUIPMENT: **ION-M85/19P****Test Data – Spurious Emissions at Antenna Terminals**

WCDMA/HSDPA

SPURS



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

Marker 1 indicates amplifier response in 850 MHz cell band

Marker 2 indicates carrier

Marker 3 indicates highest emission

EQUIPMENT: ION-M85/19P**Section 6. Field Strength of Spurious**

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 24.238
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: 1464-1484-1485-1016-791-759-760-993**Measurement Uncertainty:** +/-1.7 dB**Temperature:** 22 °C**Relative Humidity:** 48 %

RBW=VBW=100 kHz below 1000 MHz
RBW=VBW=1 MHz above 1000 MHz
Peak detector

EQUIPMENT: ION-M85/19P**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

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: **ION-M85/19P**

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
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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.

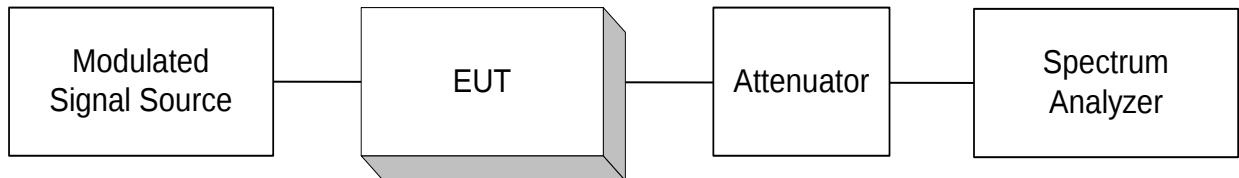
Method of Measurement TIA/EIA-603-1992

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.

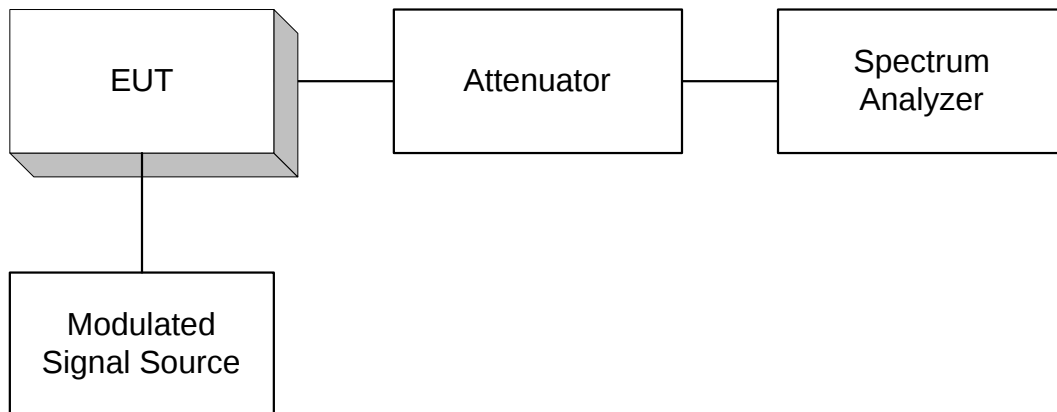
ANNEX B - TEST DIAGRAMS

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

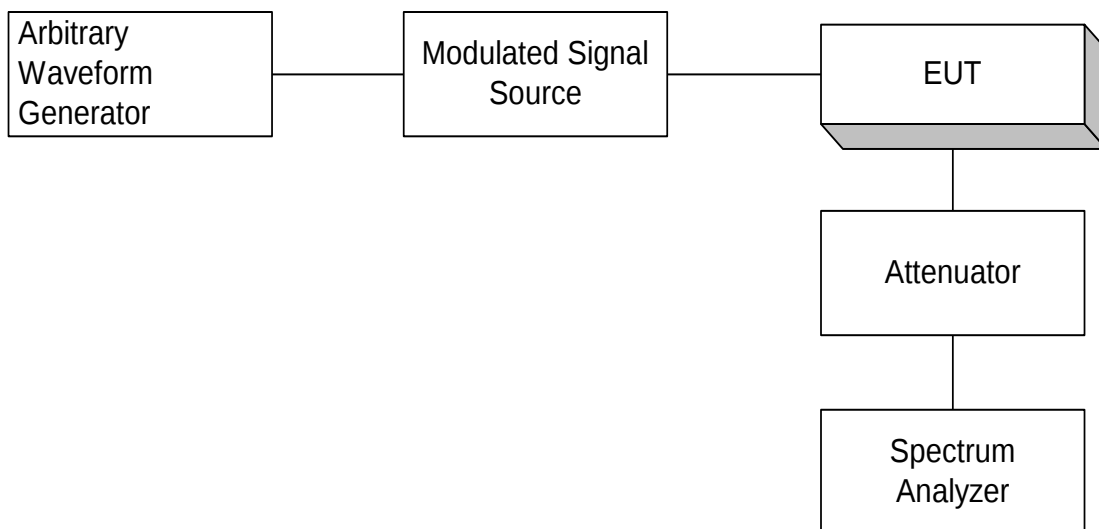
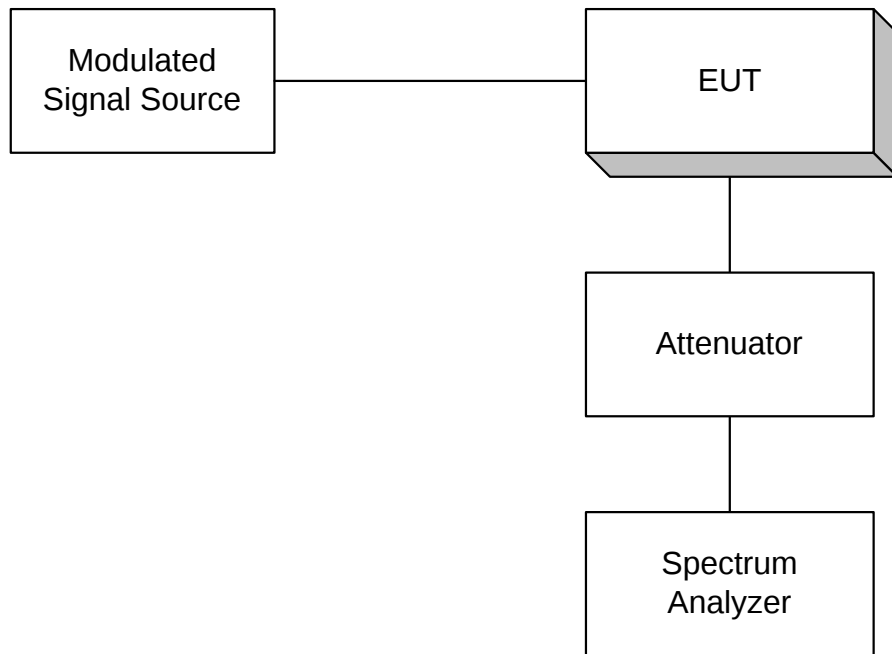
Para. No. 2.985 - R.F. Power Output



Para. No. 2.989 - Occupied Bandwidth

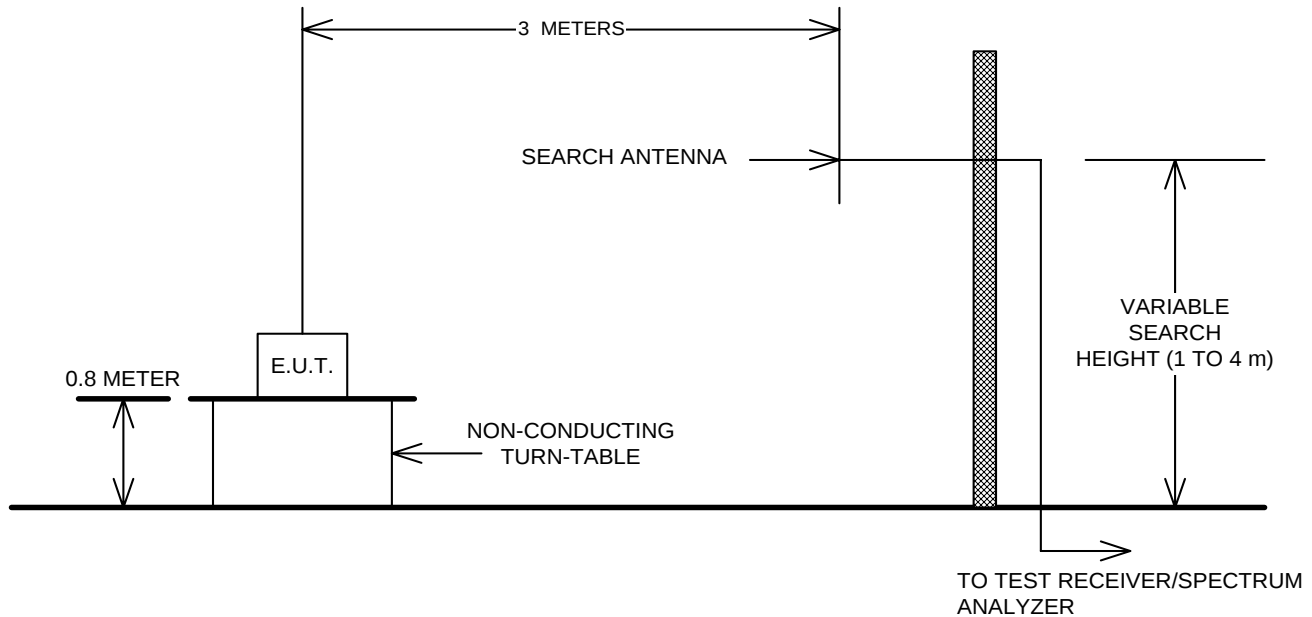


Para. No. 2.991 Spurious Emissions at Antenna Terminals



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

Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability

