



Nemko Test Report: 12250RUS1

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

**Equipment Under Test:
(E.U.T.)** ION-B TFAM80/92/19EP

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, Senior Wireless Engineer

DATE

: 15 April, 2008

APPROVED BY:

Mike Cantwell, Frontline Manager

DATE

: 21 April, 2008

Number of Pages: 41

Table of Contents

SECTION 1.	SUMMARY OF TEST RESULTS	3
SECTION 2.	GENERAL EQUIPMENT SPECIFICATION	5
SECTION 3.	RF POWER OUTPUT	7
SECTION 4.	OCCUPIED BANDWIDTH	8
SECTION 5.	SPURIOUS EMISSIONS AT ANTENNA TERMINALS	17
SECTION 6.	FIELD STRENGTH OF SPURIOUS	30
SECTION 7.	TEST EQUIPMENT LIST	31
ANNEX A - TEST DETAILS		32
ANNEX B - TEST DIAGRAMS		38

EQUIPMENT: ION-B TFAM80/92/19EP

Section 1. Summary of Test Results

Manufacturer: [Andrew Corporation](#)
Model No.: [ION-B TFAM80/92/19EP](#)
Serial No.: [074605735](#)

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

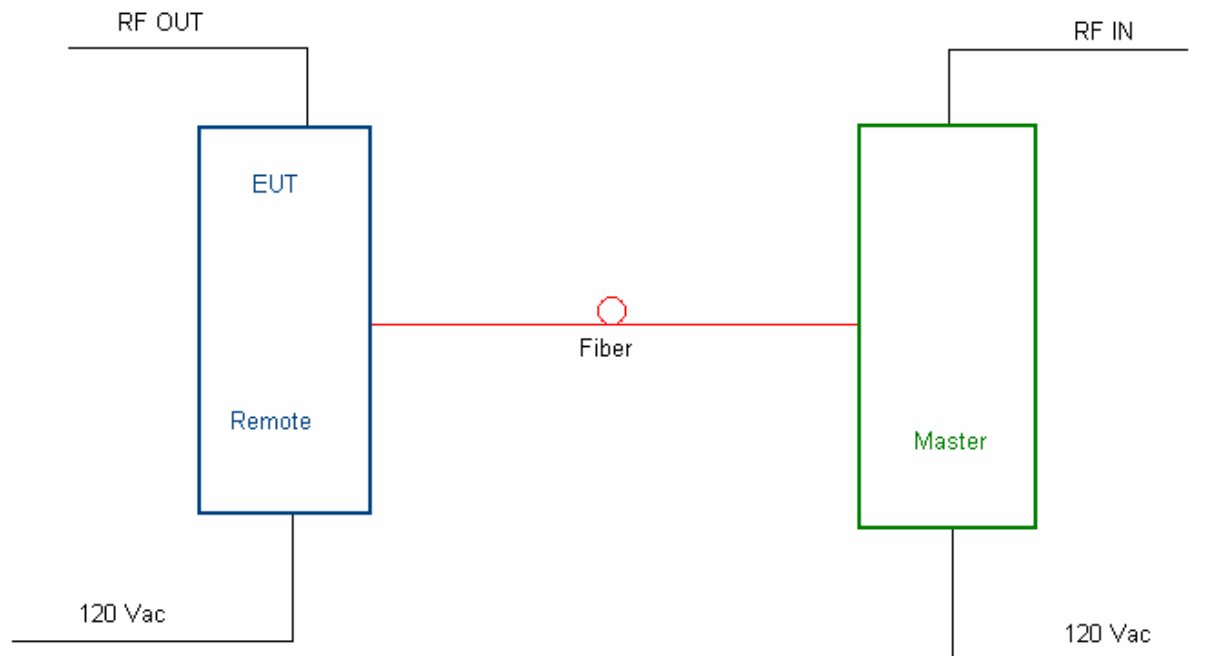
Footnotes:

Section 2. General Equipment Specification

Supply Voltage Input:		120 Vac		
Frequency Range:		Downlink:	851 to 869 MHz 935 to 941 MHz 1930 to 1995 MHz	
Frequency Range:		Uplink:	NA	
Type of Modulation and Designator:		CDMA (G7W)	GSM (GXW)	EDGE (G7W)
Output Impedance:		50 ohms		
RF Output (Rated):		Downlink	30 dBm max (1.0 Watts)	
RF Output (Rated):		Uplink	NA	
Frequency Translation:		F1-F1 ☐	F1-F2 ☐	N/A ☒
Band Selection:		Software ☐	Duplexer Change ☐	Fullband Coverage ☒

Description of EUT

The TFAH-80/92/19EP is a dual band high power remote unit designed to distribute LMR800, LMR900, and PCS1900 band signals along the same fiber.

System Diagram

Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 24.232
TESTED BY: David Light	DATE: 09 April 2008

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

	Modulation	Output per Channel (dBm)	Composite Power (dBm)	Composite Power (W)
	CDMA	25	28	0.631
	EDGE	27	30	1.0
	GSM	27	30	1.0
	W-CDMA	23	26	0.398

Equipment Used: 1659-1082-1472-1469***Measurement Uncertainty:** +/- 1.7 dB**Temperature:** 22 °C**Relative Humidity:** 32 %

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 24.238
TESTED BY: David Light	DATE: 09 April 2008

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1659-1082-1472-1469

Measurement Uncertainty: 1X10⁻⁷ ppm

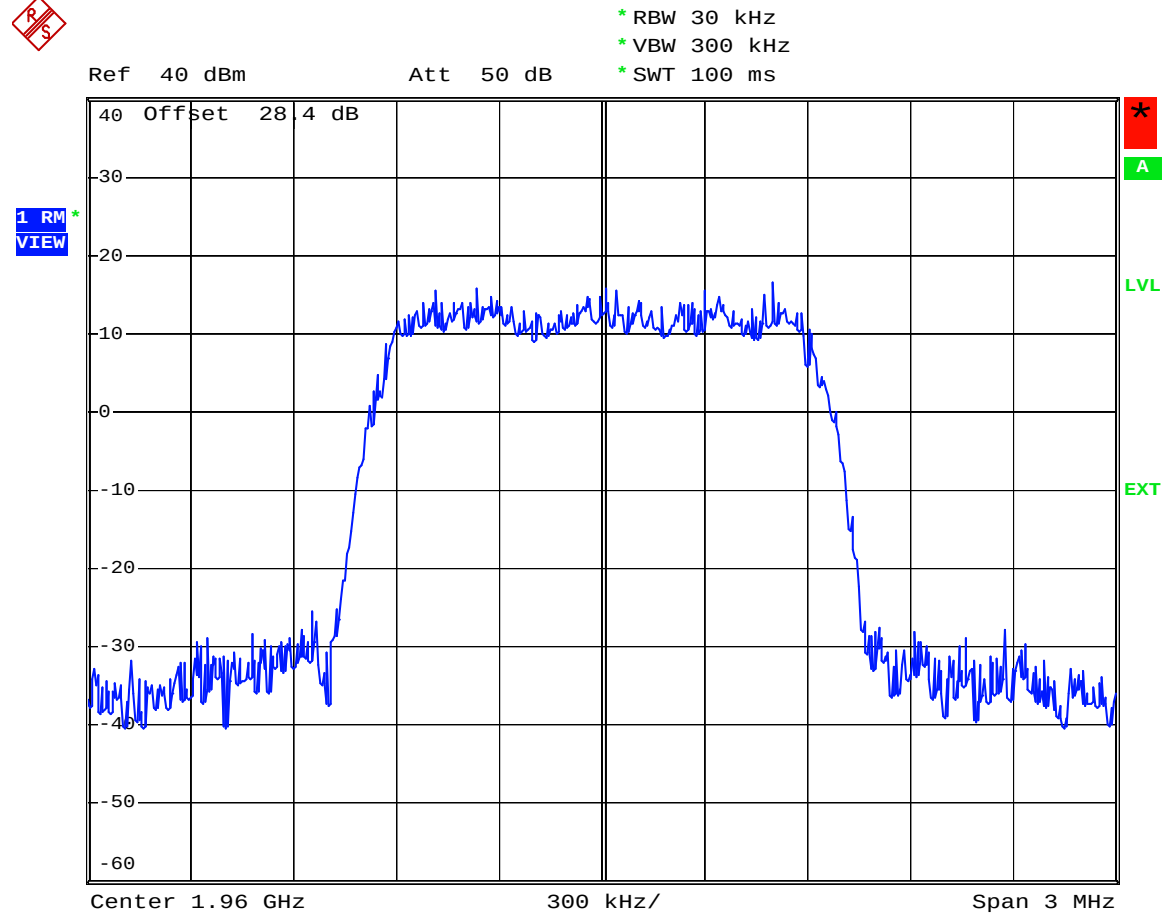
Temperature: 22 °C

Relative Humidity: 32 %

EQUIPMENT: ION-B TFAM80/92/19EP

Test Data – Occupied Bandwidth

CDMA - Output



Date: 9.APR.2008 12:11:48

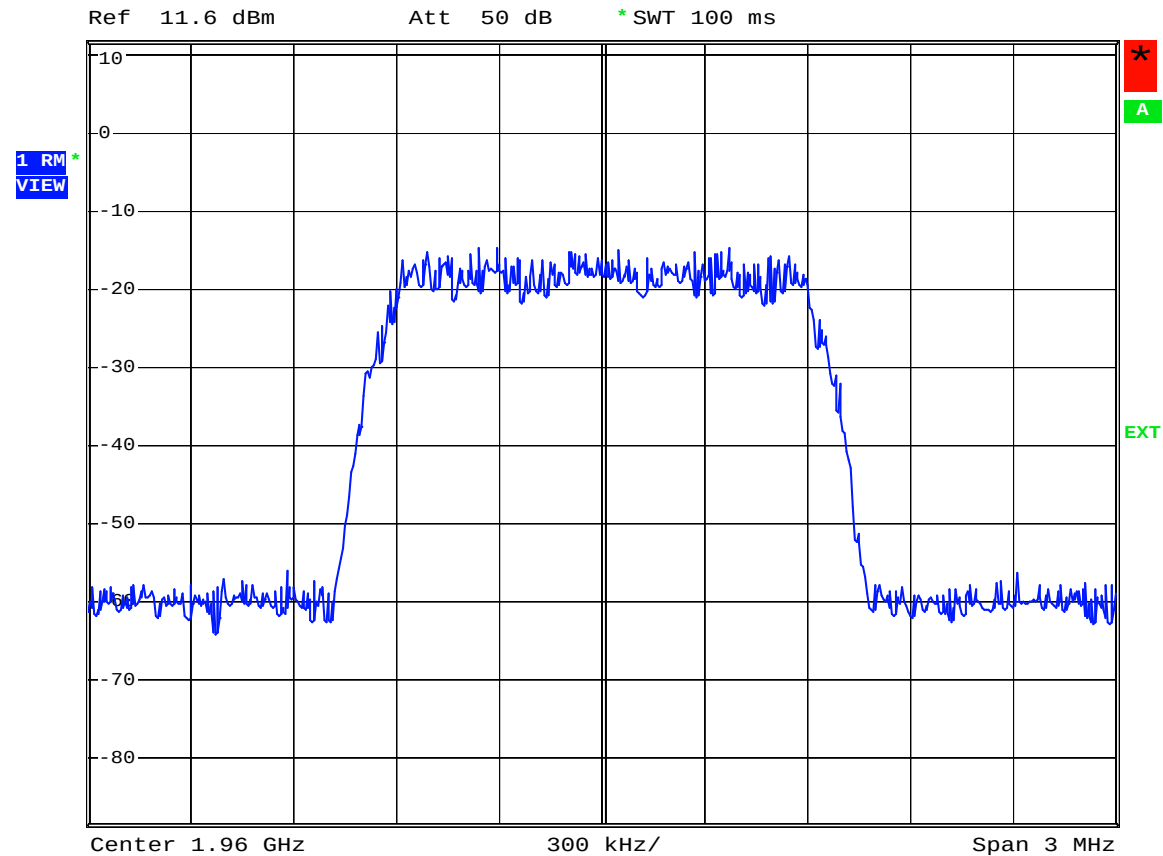
EQUIPMENT: ION-B TFAM80/92/19EP

Test Data – Occupied Bandwidth

CDMA - Input



* RBW 30 kHz
* VBW 300 kHz
* SWT 100 ms



Date: 9.APR.2008 12:12:51

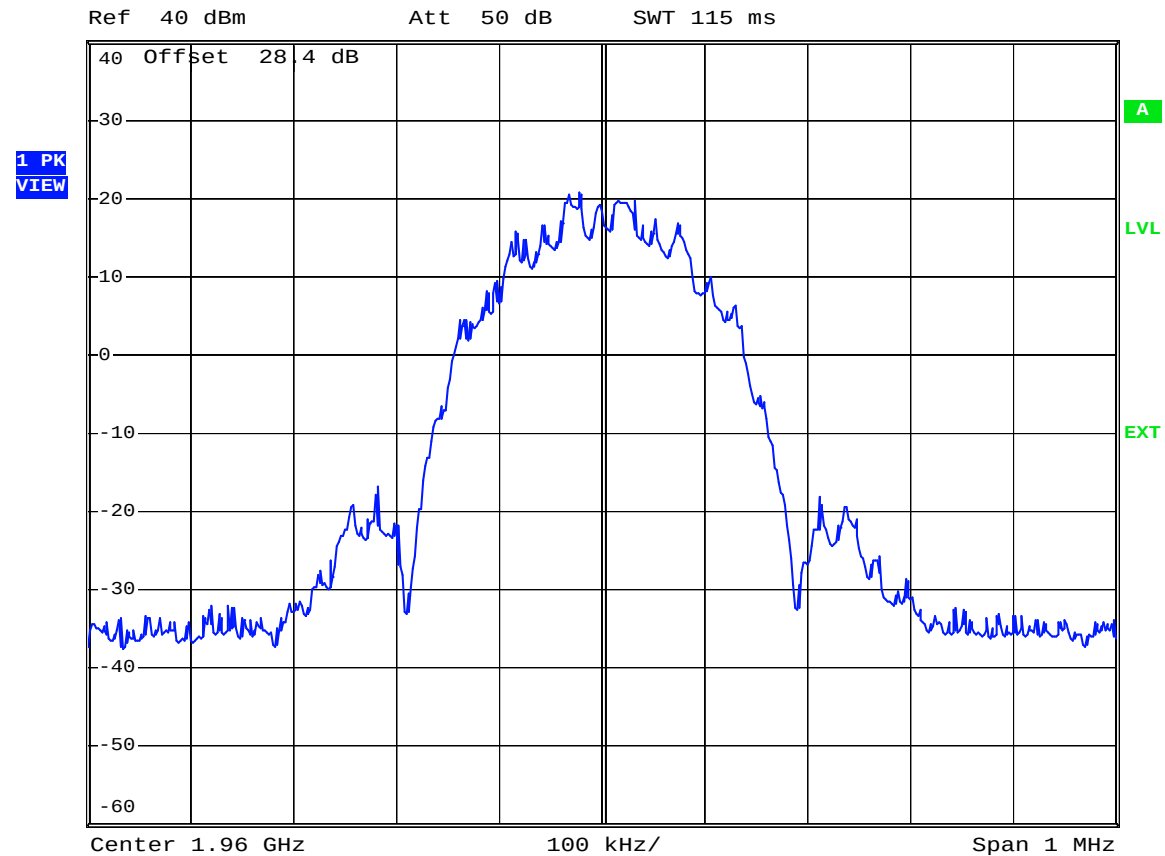
EQUIPMENT: ION-B TFAM80/92/19EP

Test Data – Occupied Bandwidth

EDGE - Output



* RBW 3 kHz
VBW 10 kHz
SWT 115 ms



Date: 9.APR.2008 12:53:09

EQUIPMENT: ION-B TFAM80/92/19EP

Test Data – Occupied Bandwidth

EDGE - Input



* RBW 3 kHz
VBW 10 kHz
SWT 115 ms



Date: 9.APR.2008 12:54:07

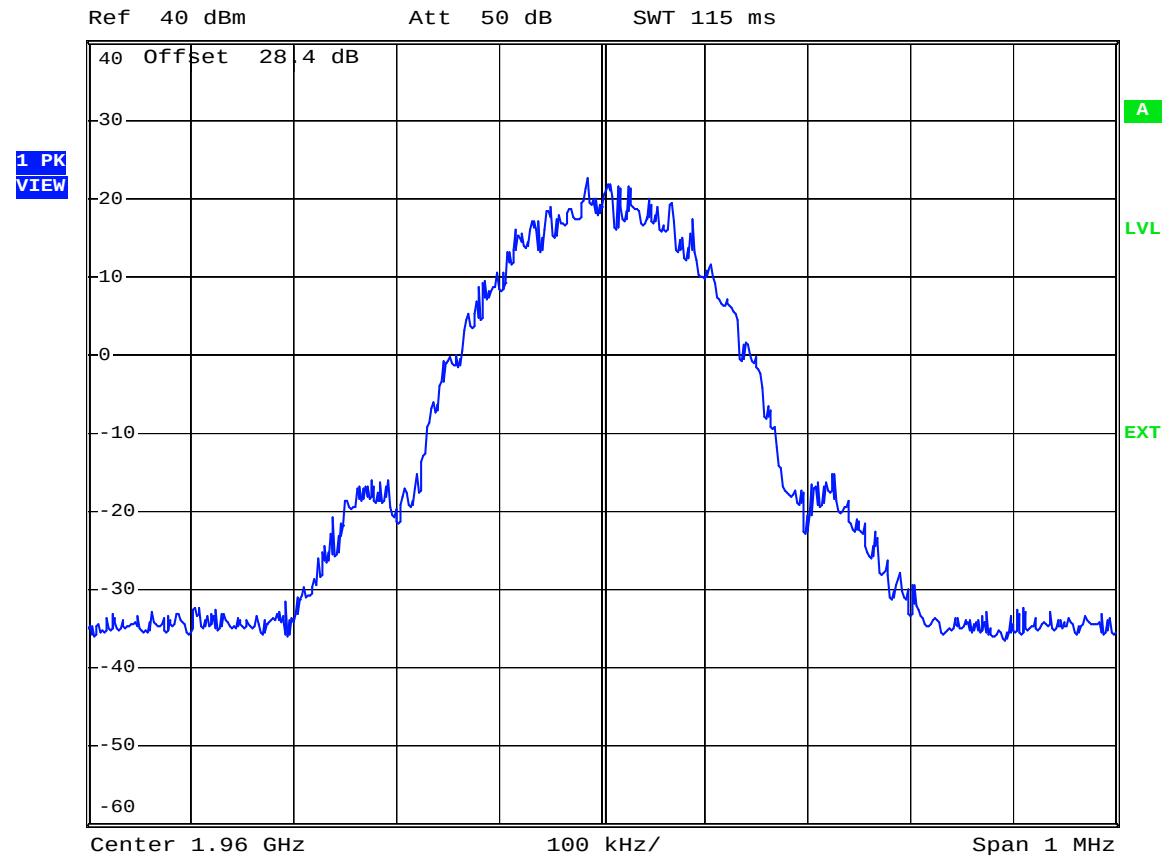
EQUIPMENT: ION-B TFAM80/92/19EP

Test Data – Occupied Bandwidth

GSM - Output



* RBW 3 kHz
VBW 10 kHz
SWT 115 ms



Date: 9.APR.2008 12:40:27

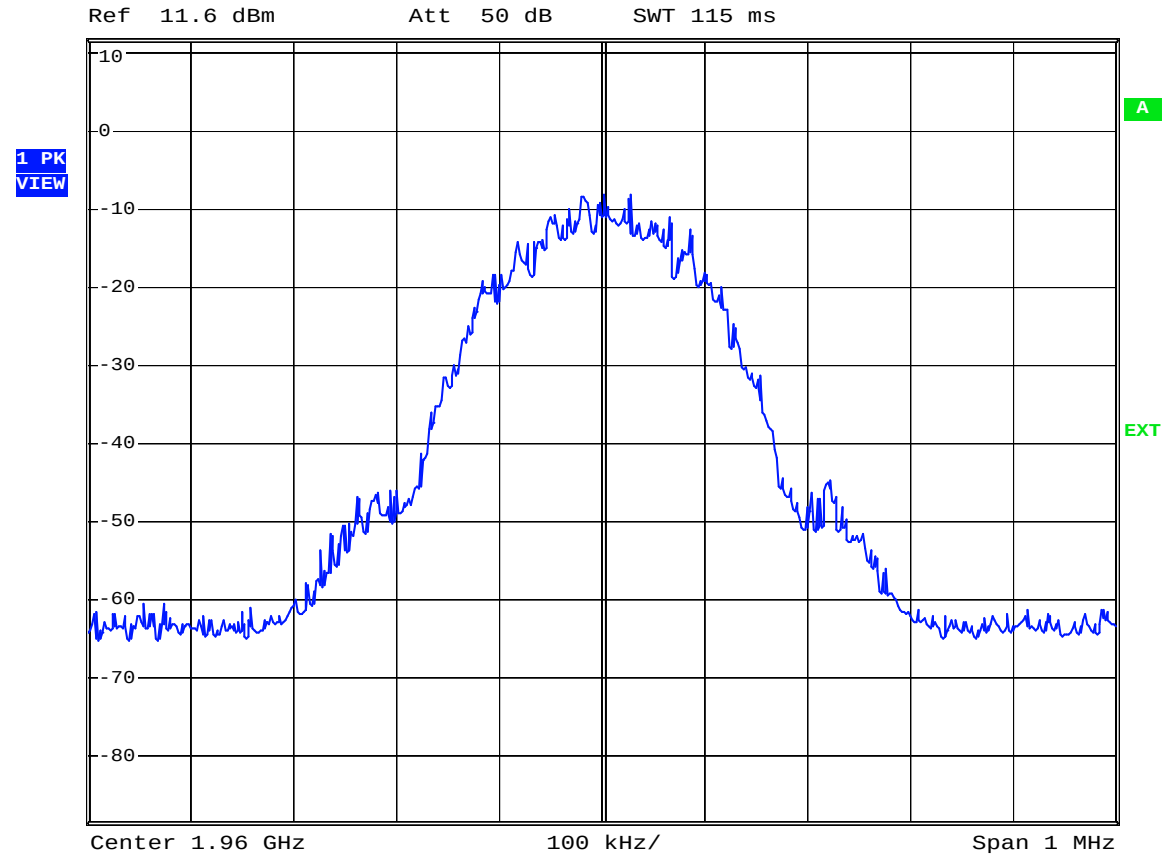
EQUIPMENT: ION-B TFAM80/92/19EP

Test Data – Occupied Bandwidth

GSM - Input



* RBW 3 kHz
VBW 10 kHz
SWT 115 ms



Date: 9.APR.2008 12:41:29

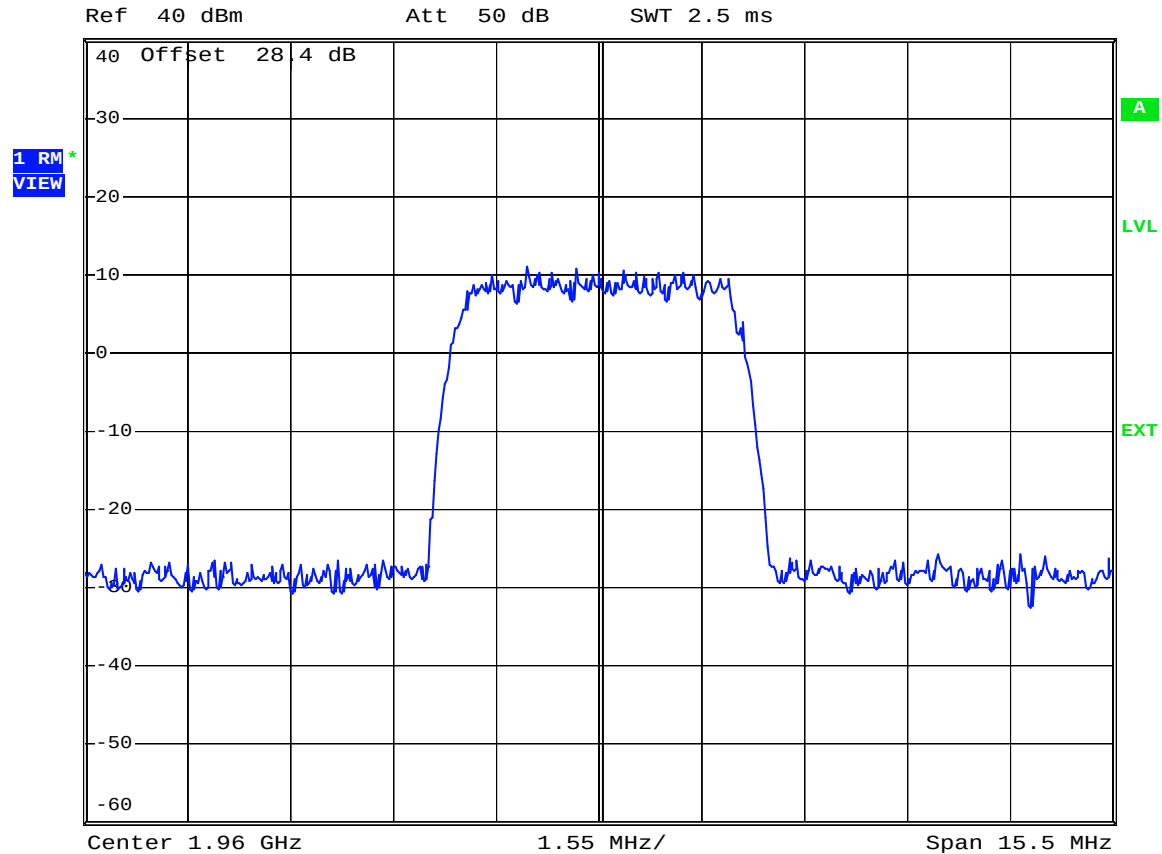
EQUIPMENT: ION-B TFAM80/92/19EP

Test Data – Occupied Bandwidth

W-CDMA - Output



* RBW 100 kHz
* VBW 300 kHz
SWT 2.5 ms



Date: 9.APR.2008 14:15:05

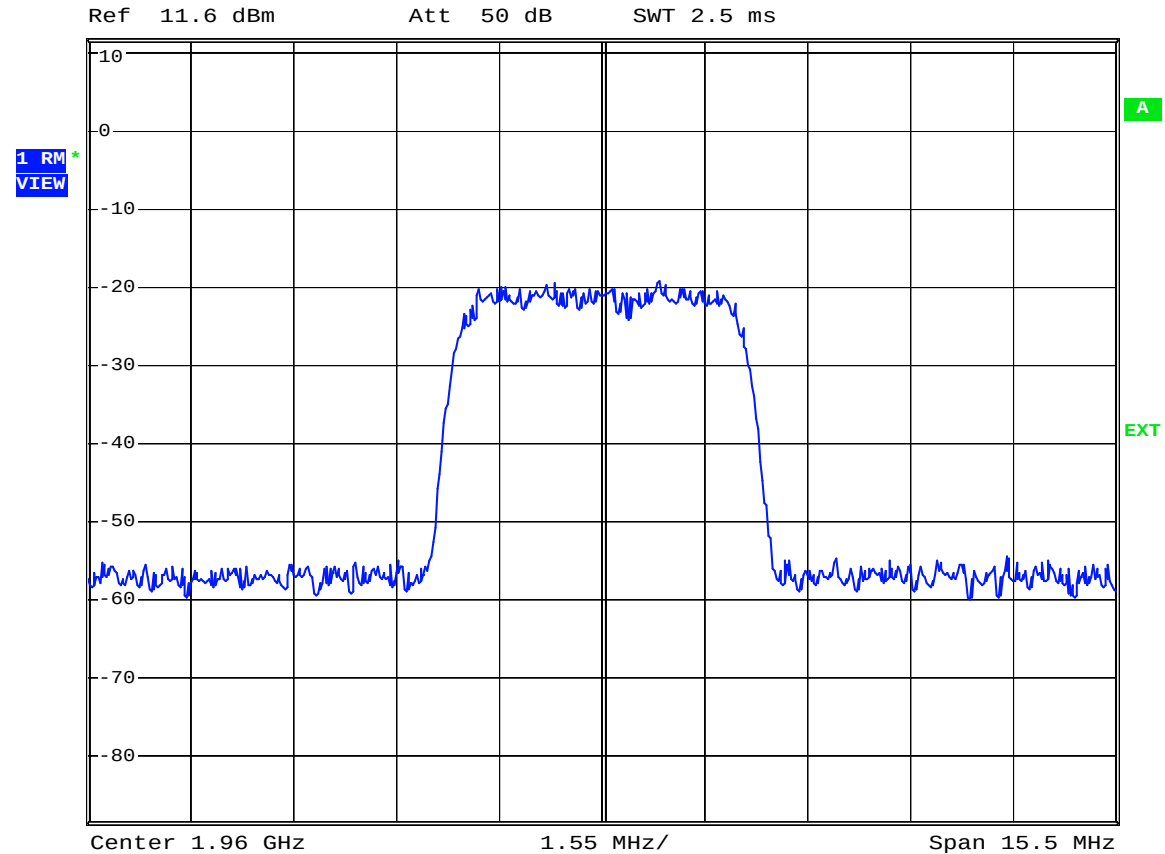
EQUIPMENT: ION-B TFAM80/92/19EP

Test Data – Occupied Bandwidth

W-CDMA - Input



* RBW 100 kHz
* VBW 300 kHz
SWT 2.5 ms



Date: 9.APR.2008 14:16:46

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals PARA. NO.: 24.238

TESTED BY: David Light DATE: 09 April 2008

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1659-1082-1472-1469-1464

Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

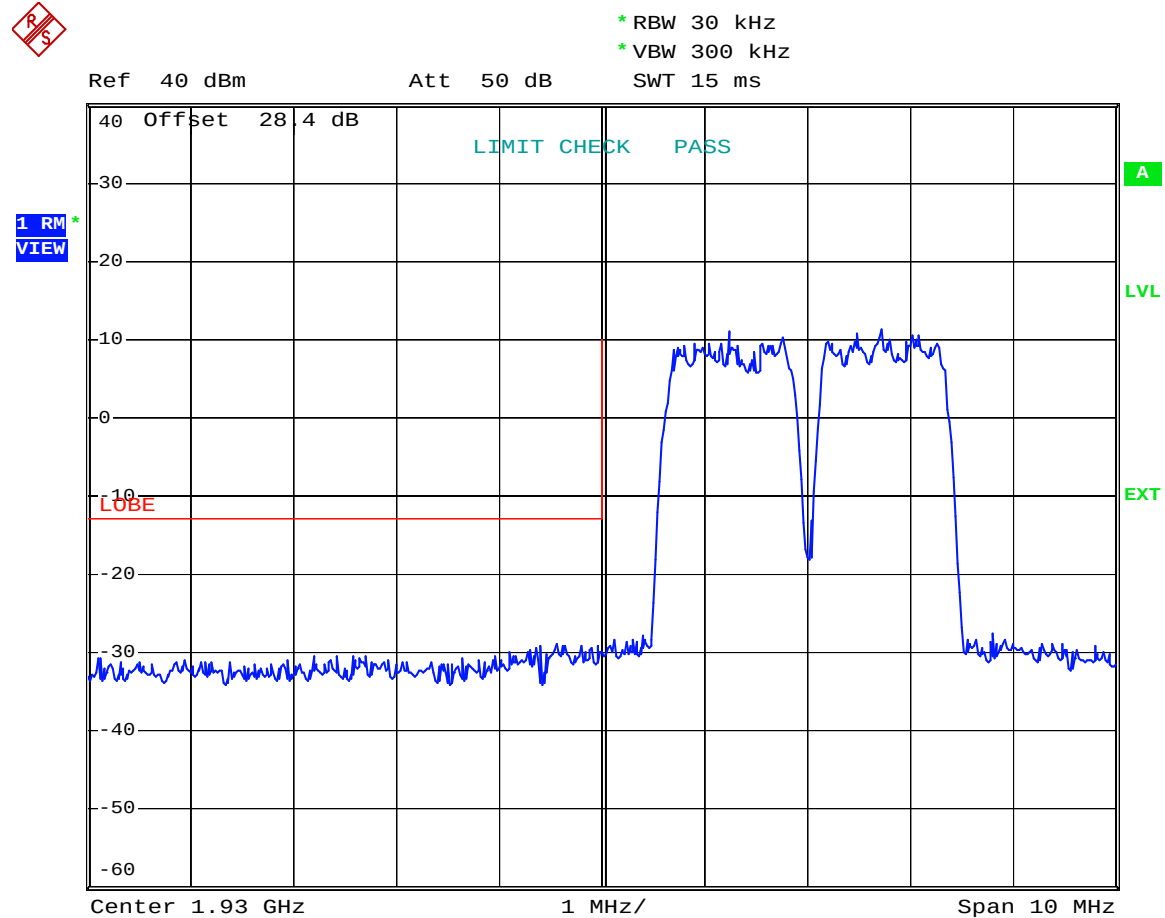
Relative Humidity: 32 %

EQUIPMENT: ION-B TFAM80/92/19EP

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

CDMA



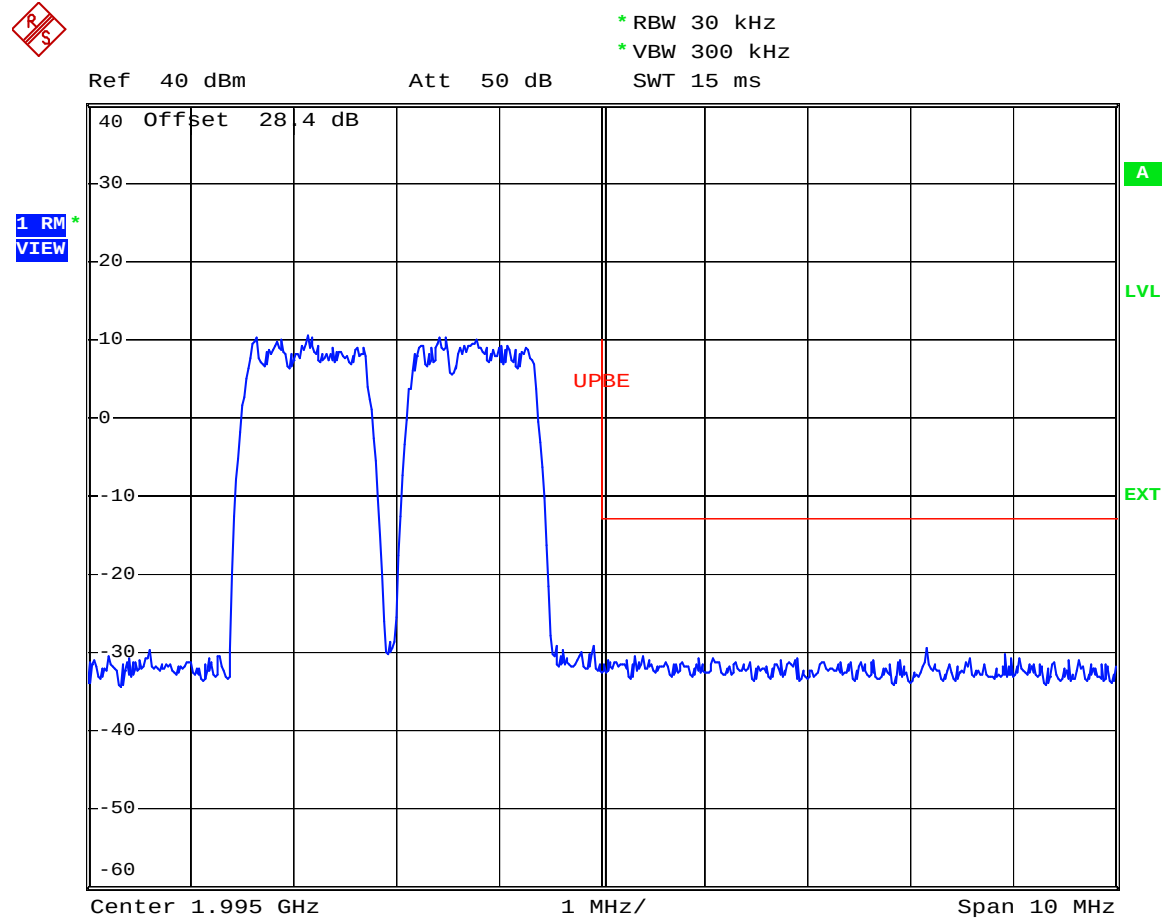
Date: 9.APR.2008 12:21:28

EQUIPMENT: ION-B TFAM80/92/19EP

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation

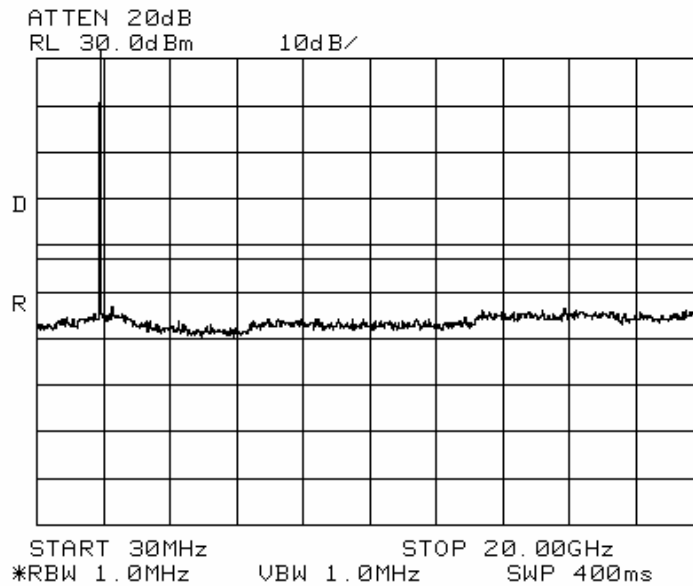
CDMA



Date: 9.APR.2008 12:30:00

Test Data – Spurious Emissions at Antenna Terminals

Spurs – CDMA



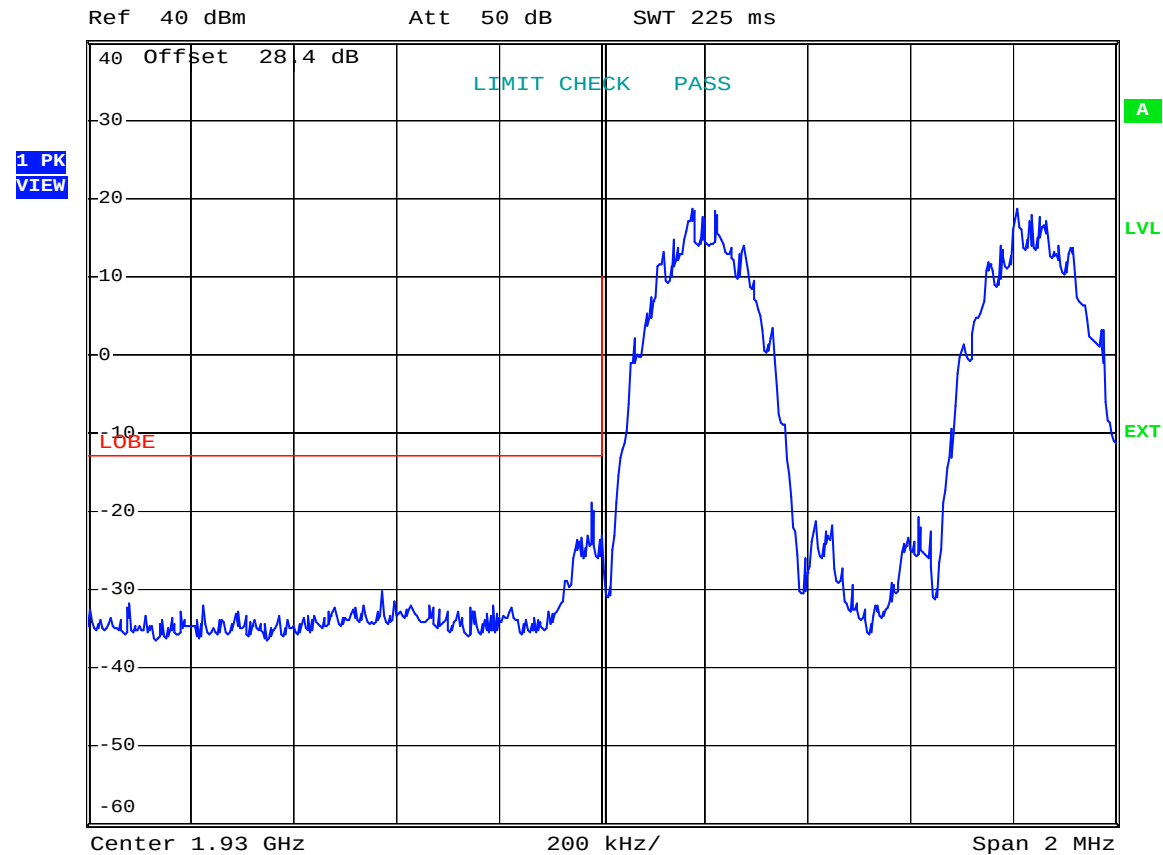
Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

EDGE



* RBW 3 kHz
VBW 10 kHz
SWT 225 ms



Date: 9.APR.2008 12:51:38

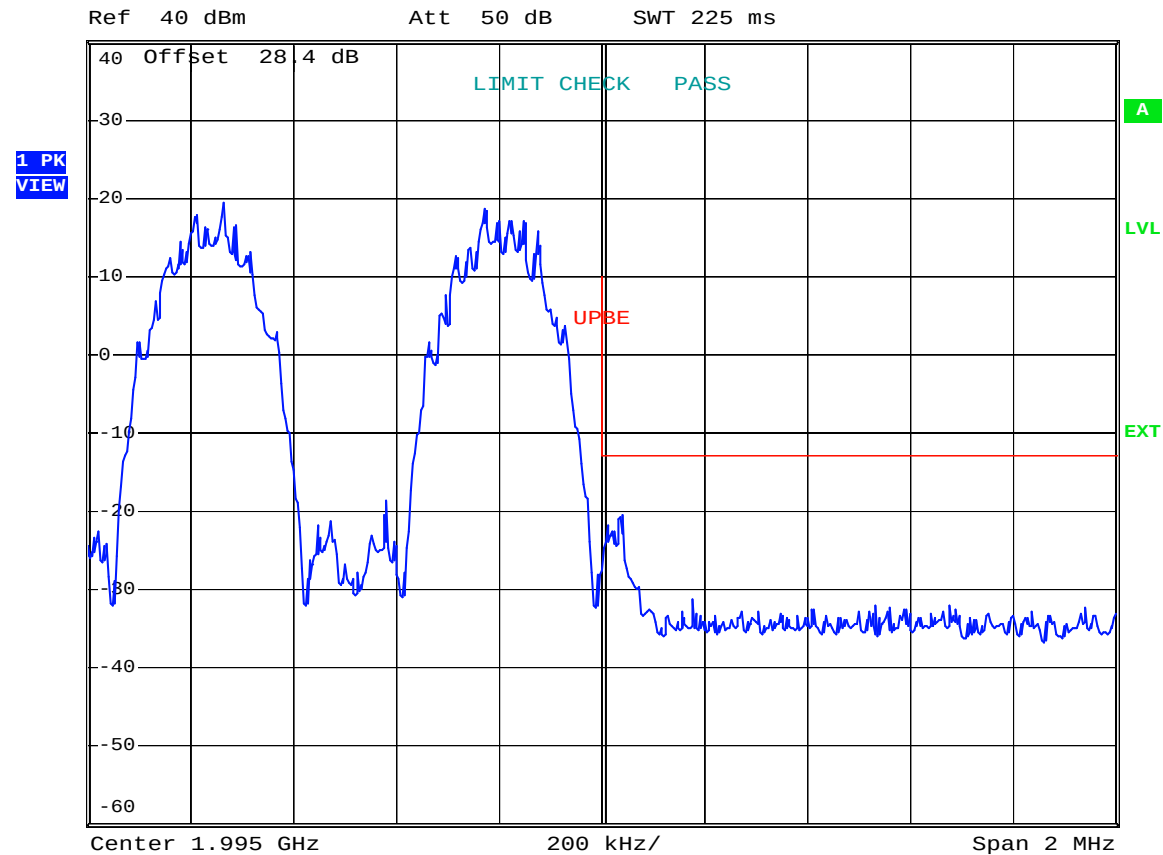
Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation

EDGE



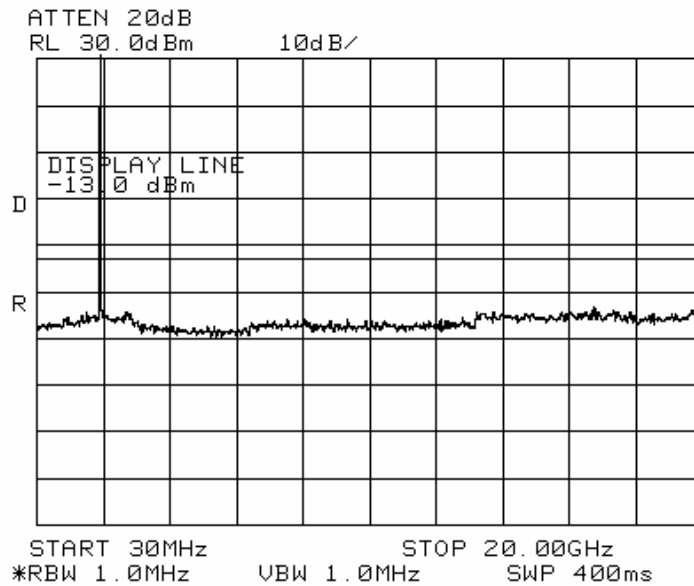
* RBW 3 kHz
VBW 10 kHz
SWT 225 ms



Date: 9.APR.2008 12:50:00

Test Data – Spurious Emissions at Antenna Terminals

Spurs – EDGE

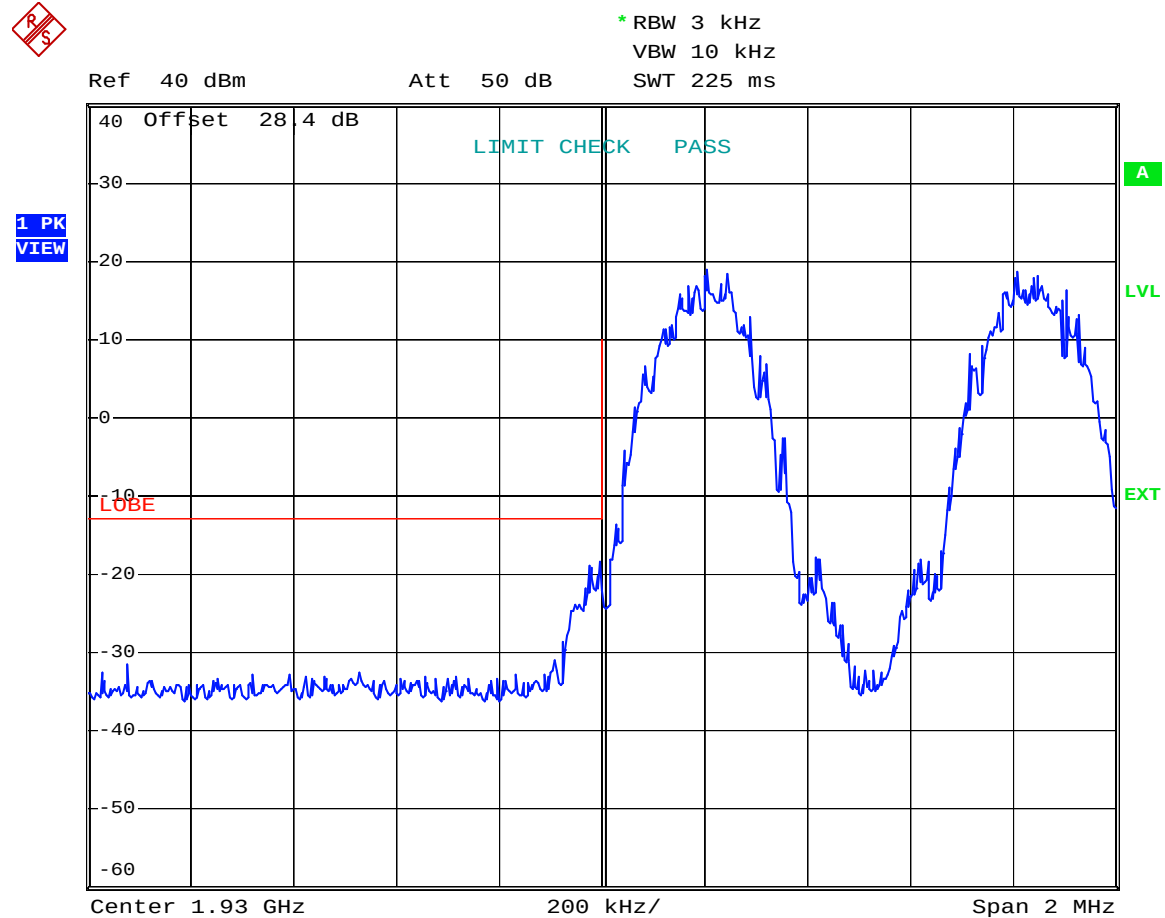


EQUIPMENT: ION-B TFAM80/92/19EP

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

GSM



Date: 9.APR.2008 12:44:42

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation

GSM



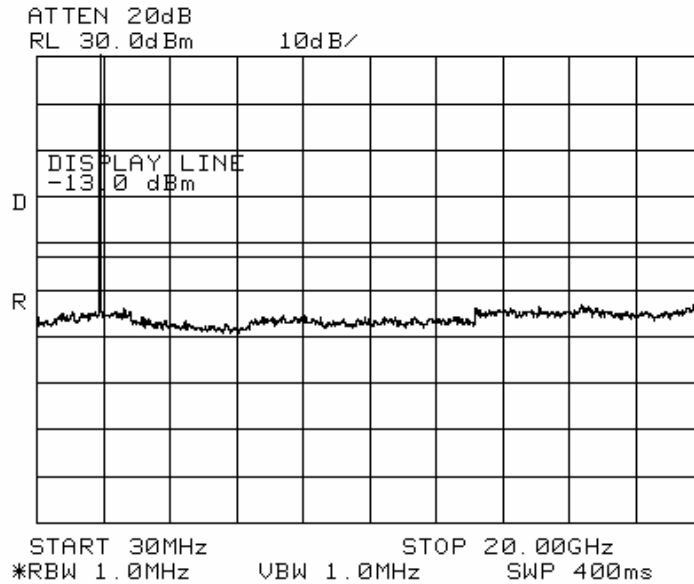
* RBW 3 kHz
VBW 10 kHz
SWT 225 ms



Date: 9.APR.2008 12:46:19

Test Data – Spurious Emissions at Antenna Terminals

Spurs – GSM



Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

W-CDMA



* RBW 100 kHz

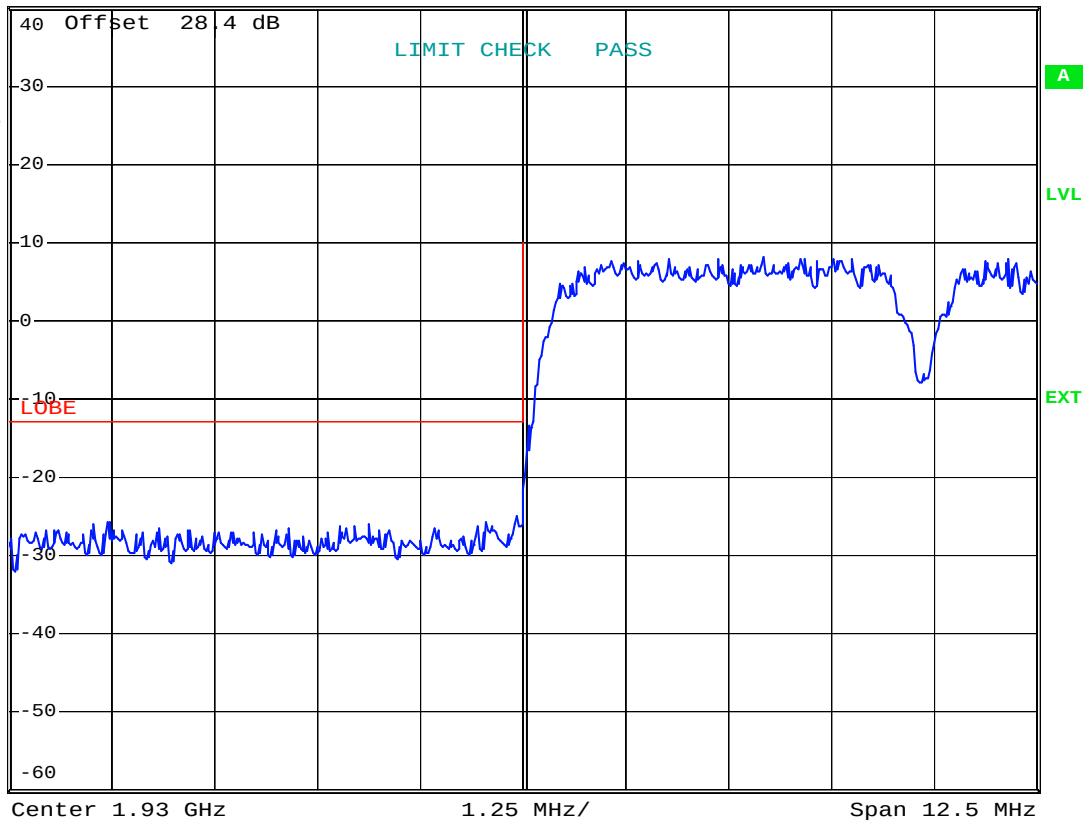
VBW 1 MHz

SWT 2.5 ms

Ref 40 dBm

Att 50 dB

1 RM
VIEW

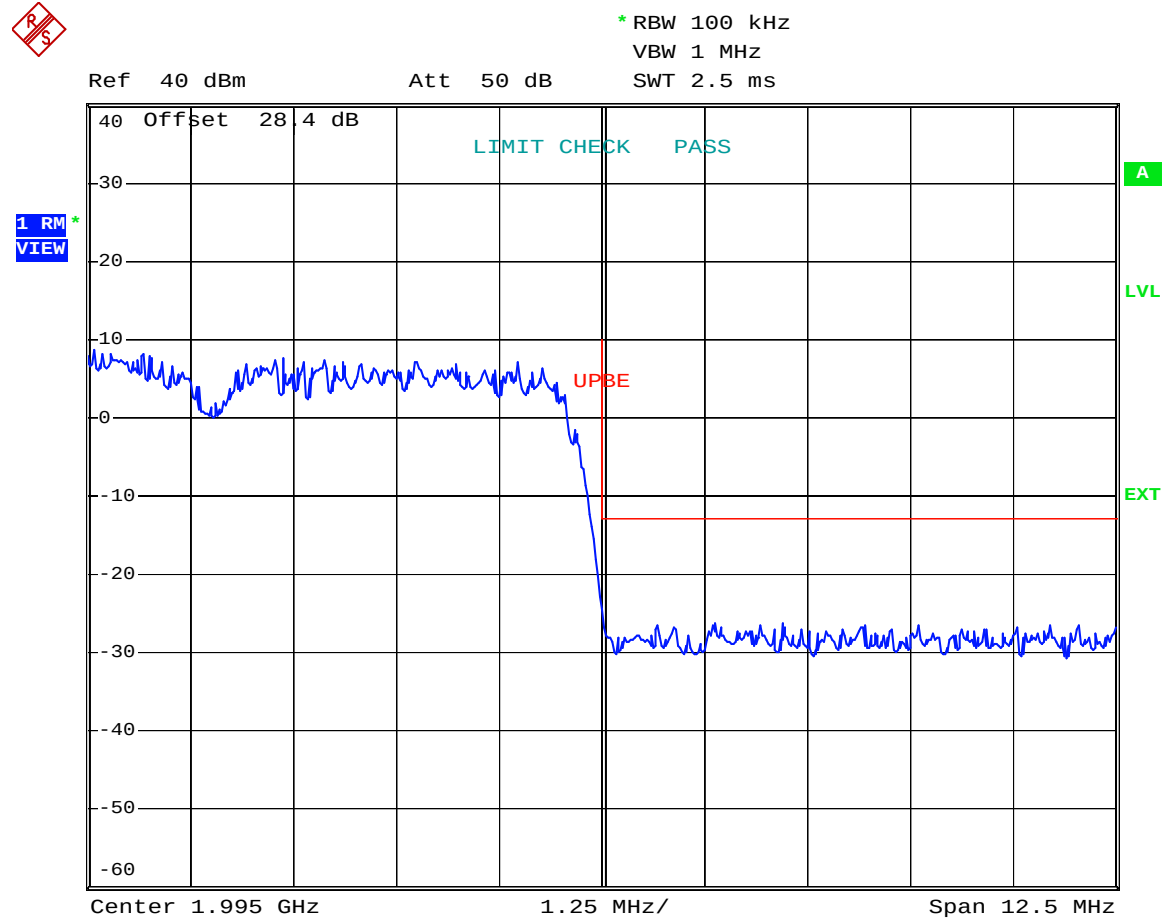


Date: 9.APR.2008 14:21:00

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation

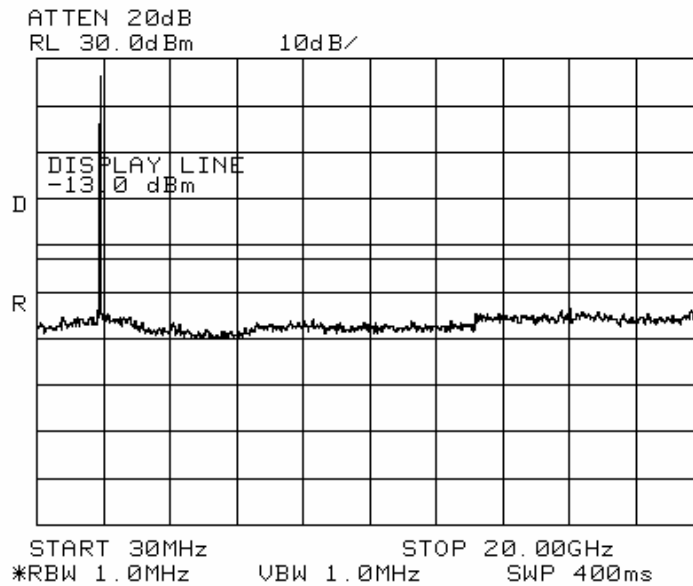
W-CDMA



Date: 9.APR.2008 14:22:40

Test Data – Spurious Emissions at Antenna Terminals

Spurs – W-CDMA -



Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 24.238
TESTED BY: David Light	DATE: 10 April 2008

Test Results: Complies.**Test Data:** There were no emissions detected above the noise floor which was at least 20 dB below the specification limit of -13 dBm.

The spectrum was searched from 30 MHz to 10 GHz

RBW = VBW = 1 MHz, Peak detector

Equipment Used: 993-1016-1464-1484-1485**Measurement Uncertainty:** +/-1.7 dB**Temperature:** 20 °C**Relative Humidity:** 30 %

Section 7. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
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
1472	20db Attenuator DC 18 Ghz	Omni Spectra 20600-20db	NONE	CBU	N/A
1469	10 db Attenuator DC 18 Ghz	MCL Inc. BW-S10W2 10db-2WDC	NONE	CBU	N/A
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/24/07	01/24/09
993	Horn antenna	A.H. Systems SAS-200/571	XXX	08/31/07	08/30/08
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	05/01/07	04/30/08
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

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.

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.

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

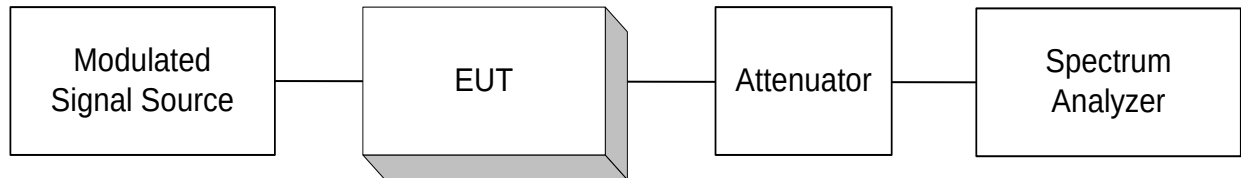
The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. The frequency counter and signal generator are phase locked with the same 10 MHz reference frequency by connecting the 10 MHz ref. out of the counter to the 10 MHz ref, in of the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

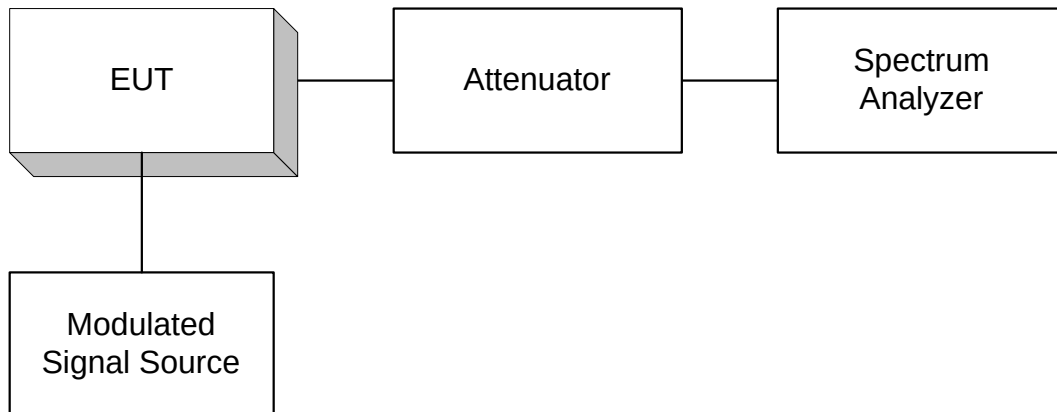
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

ANNEX B - TEST DIAGRAMS

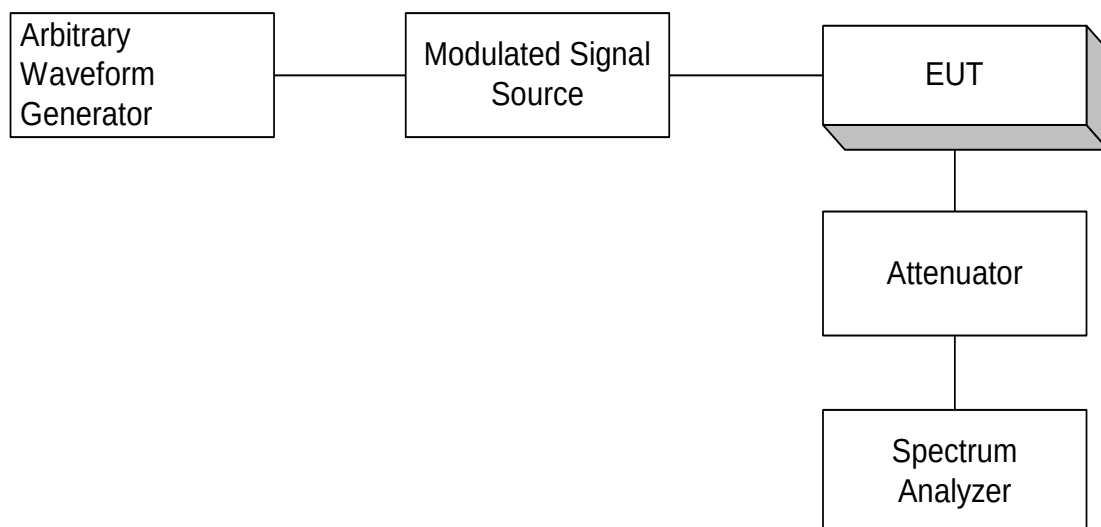
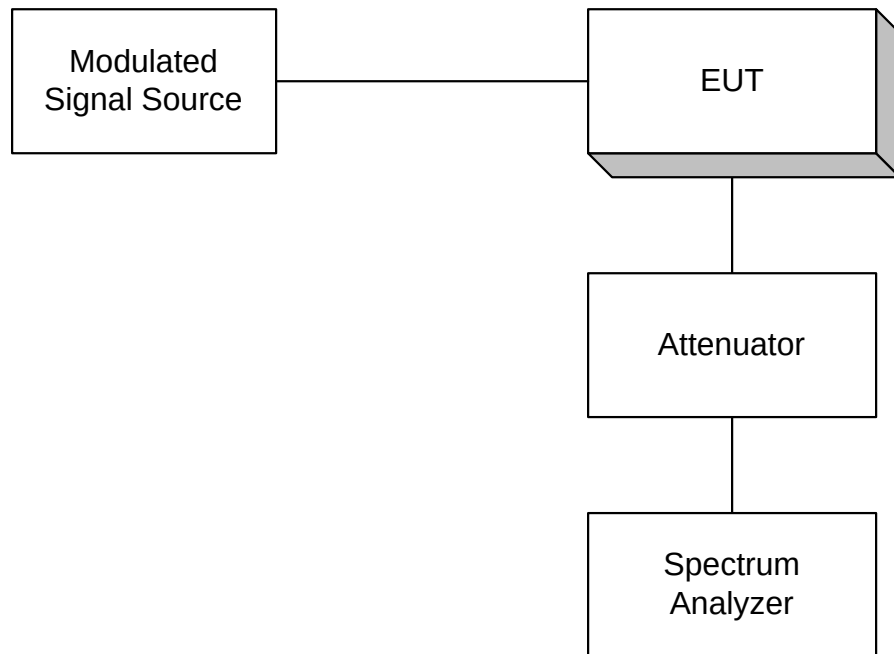
Para. No. 2.985 - R.F. Power Output



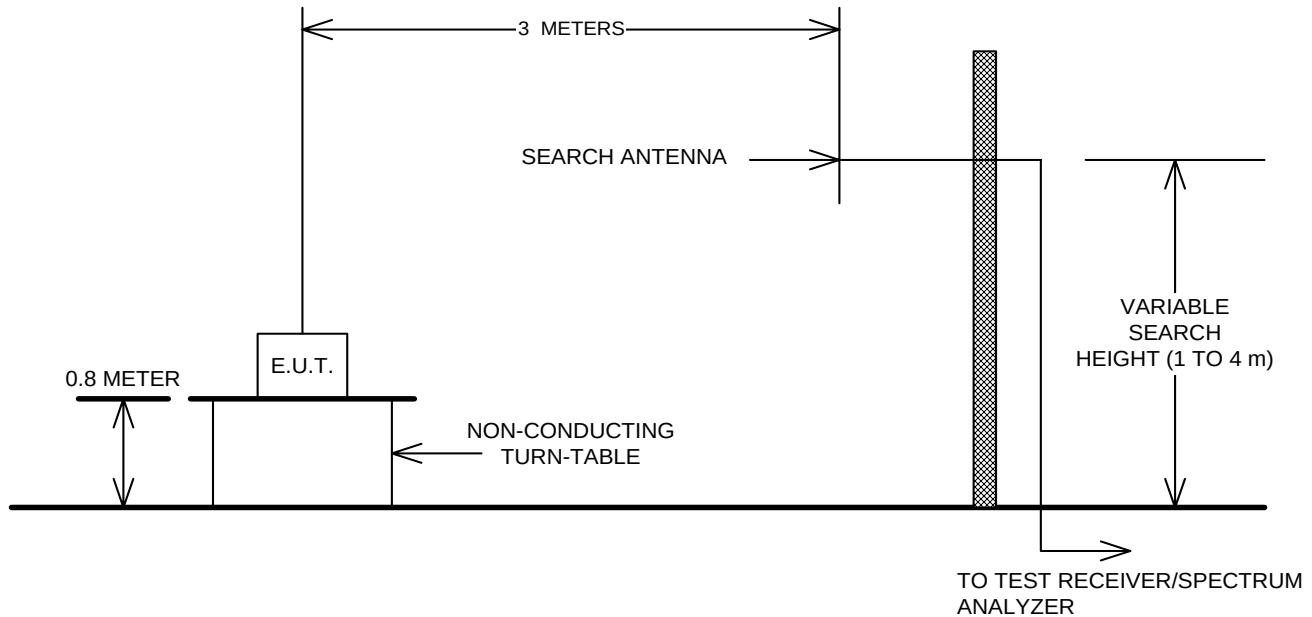
Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability

