



Nemko Test Report: 12250RUS2

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

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

In Accordance With: **CFR 47 Part 90, Subpart I**
Private Land Mobile Repeater

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'.

David Light, Senior Wireless Engineer

DATE

: 15 April, 2008

APPROVED BY:

A handwritten signature in black ink, appearing to read 'Mike Cantwell'.

Mike Cantwell, Frontline Manager

DATE

: 21 April, 2008

Number of Pages: 38

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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 Part 90, Subpart I.

☒	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	90.205 / 90.635	30 dBW	Complies
Occupied Bandwidth	90.210	Input/Output	Complies
Spurious Emissions at Antenna Terminals	90.210	Mask	Complies
Field Strength of Spurious Emissions	90.210	Mask	Complies
Frequency Stability	90.213	0.1 ppm	NA

Footnotes For N/A's:

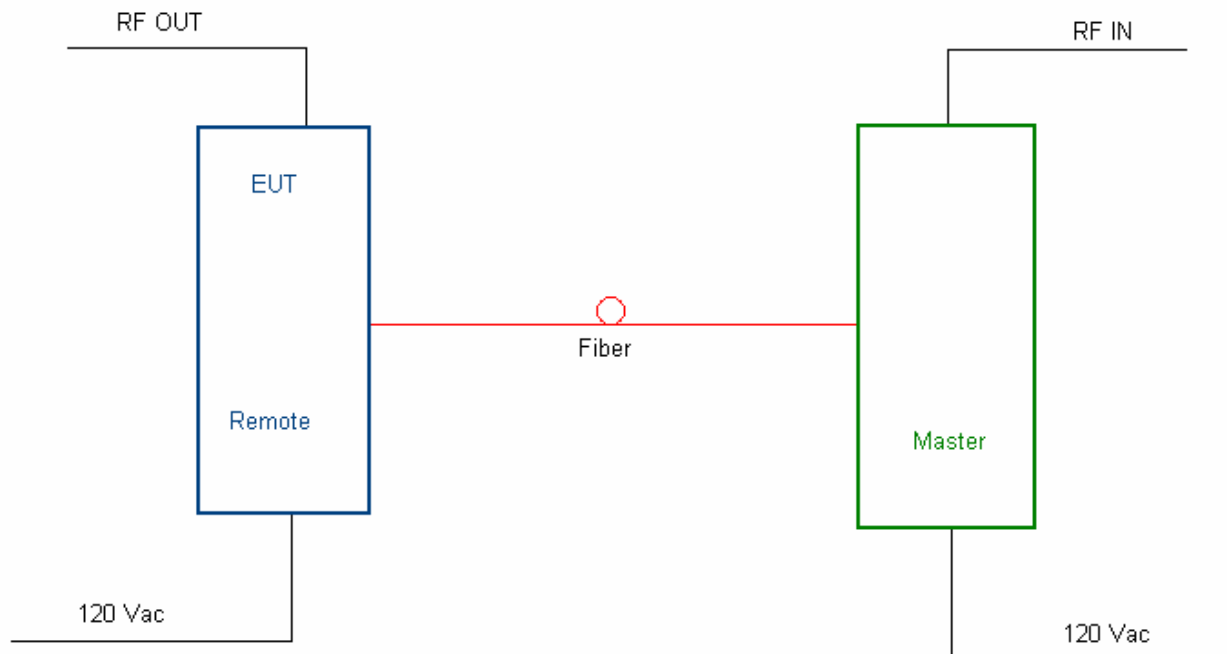
- (1) Since the E.U.T. does not contain modulation circuitry modulation testing was not performed.
- (2) Since the E.U.T. is not a keyed carrier system, Transient Frequency Behavior was not performed.

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:		Analog (F8W,F1D)	iDEN (GXW)	
Output Impedance:		50 ohms		
RF Output (Rated):	Downlink	27 dBm max (0.5 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.: 2.985
TESTED BY: David Light	DATE: 09 April 2008

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

Band	Modulation	Output per Channel (dBm)	Composite Power (dBm)	Composite Power (W)
800 MHz	Analog	24	27	0.5
800 MHz	iDEN	19	22	0.158
900 MHz	Analog	24	27	0.5
900 MHz	iDEN	19	22	0.158

Equipment Used: 1659-1472-1469-1082**Measurement Uncertainty:** +/- 1.7 dB**Temperature:** 22 °C**Relative Humidity:** 35 %

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.989
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: 35 %

Test Data – Occupied Bandwidth

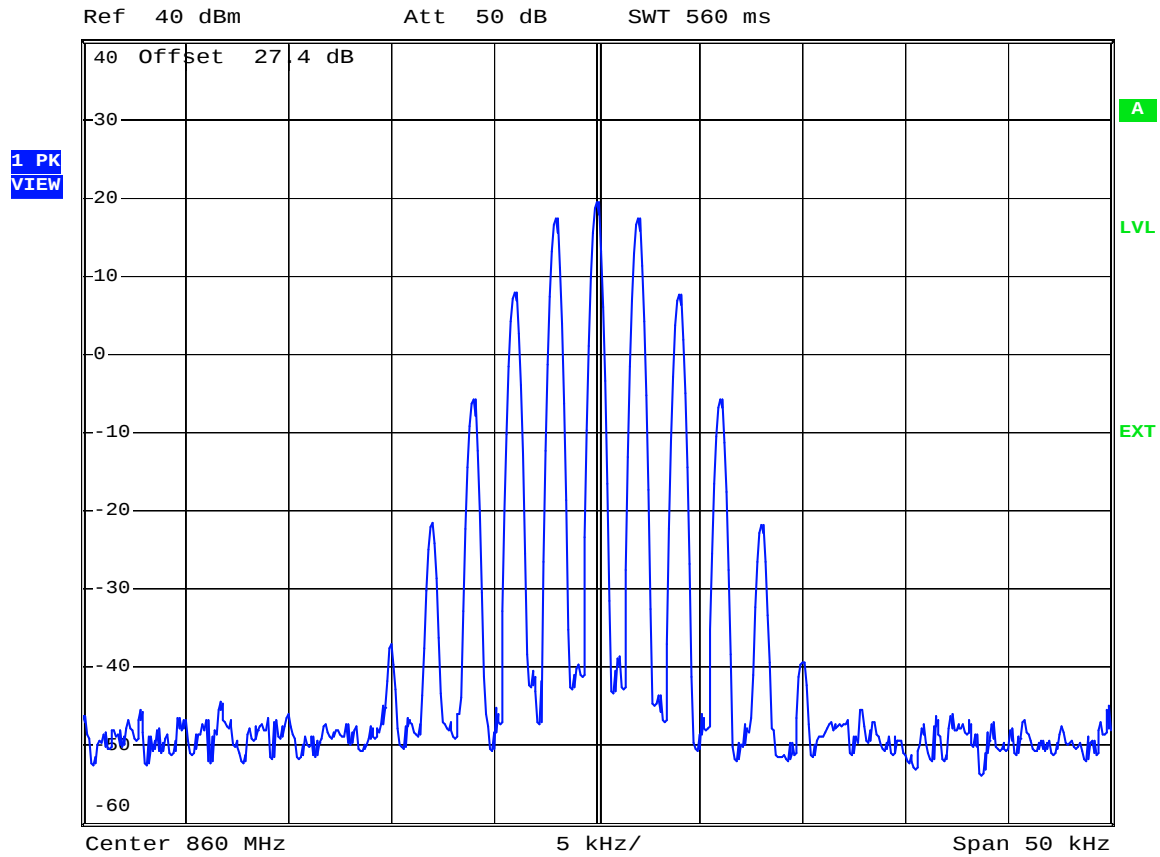
800 Analog - Output



* RBW 300 Hz

VBW 1 kHz

SWT 560 ms



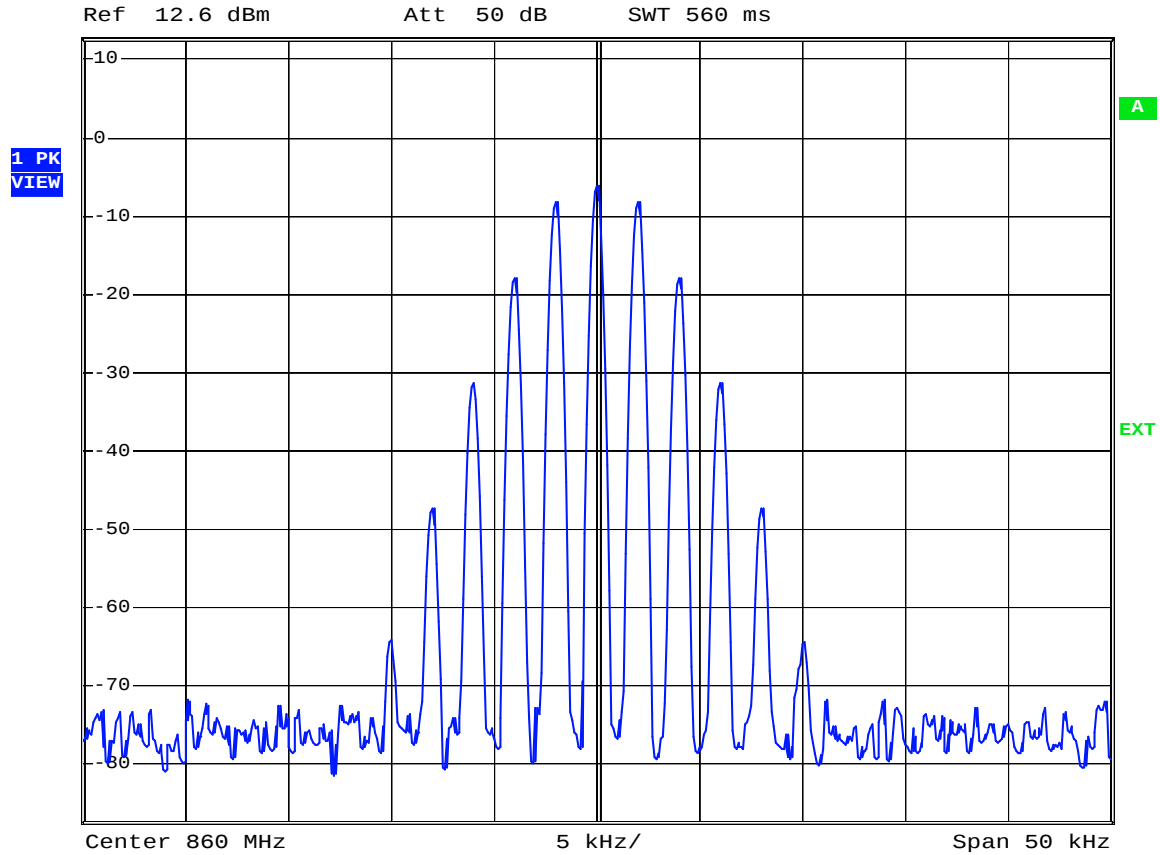
Date: 9.APR.2008 16:37:31

Test Data – Occupied Bandwidth

800 Analog - Input



* RBW 300 Hz
VBW 1 kHz
SWT 560 ms



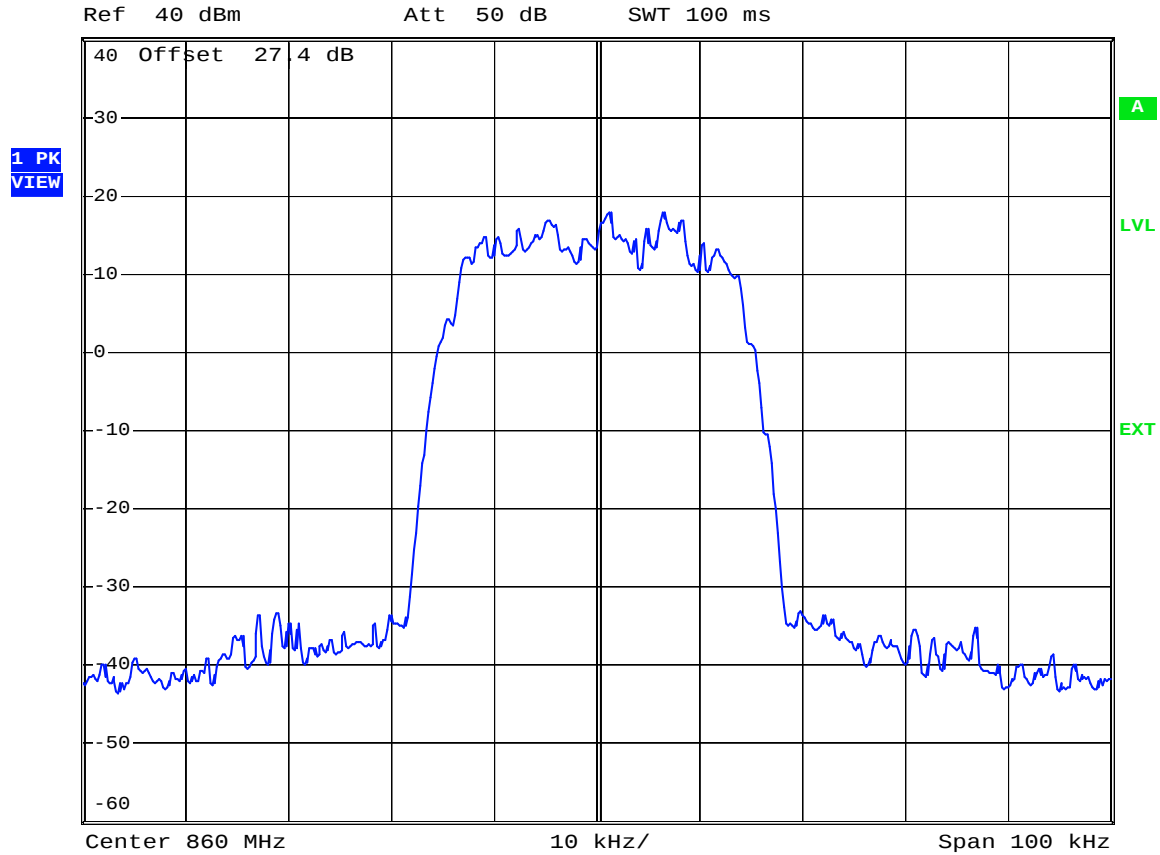
Date: 9.APR.2008 16:38:19

Test Data – Occupied Bandwidth

800 iDEN - Output



* RBW 1 kHz
VBW 3 kHz
SWT 100 ms



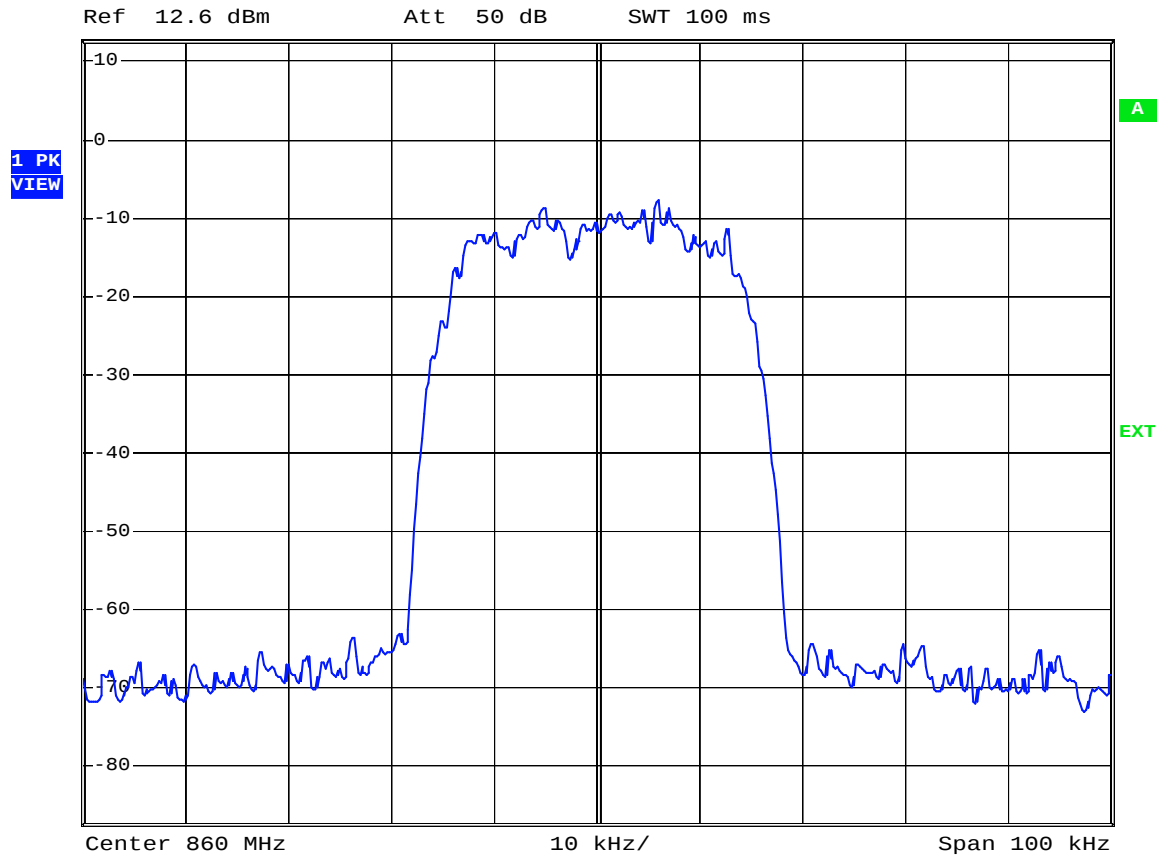
Date: 9.APR.2008 16:24:06

Test Data – Occupied Bandwidth

800 iDEN - Input



* RBW 1 kHz
VBW 3 kHz
SWT 100 ms



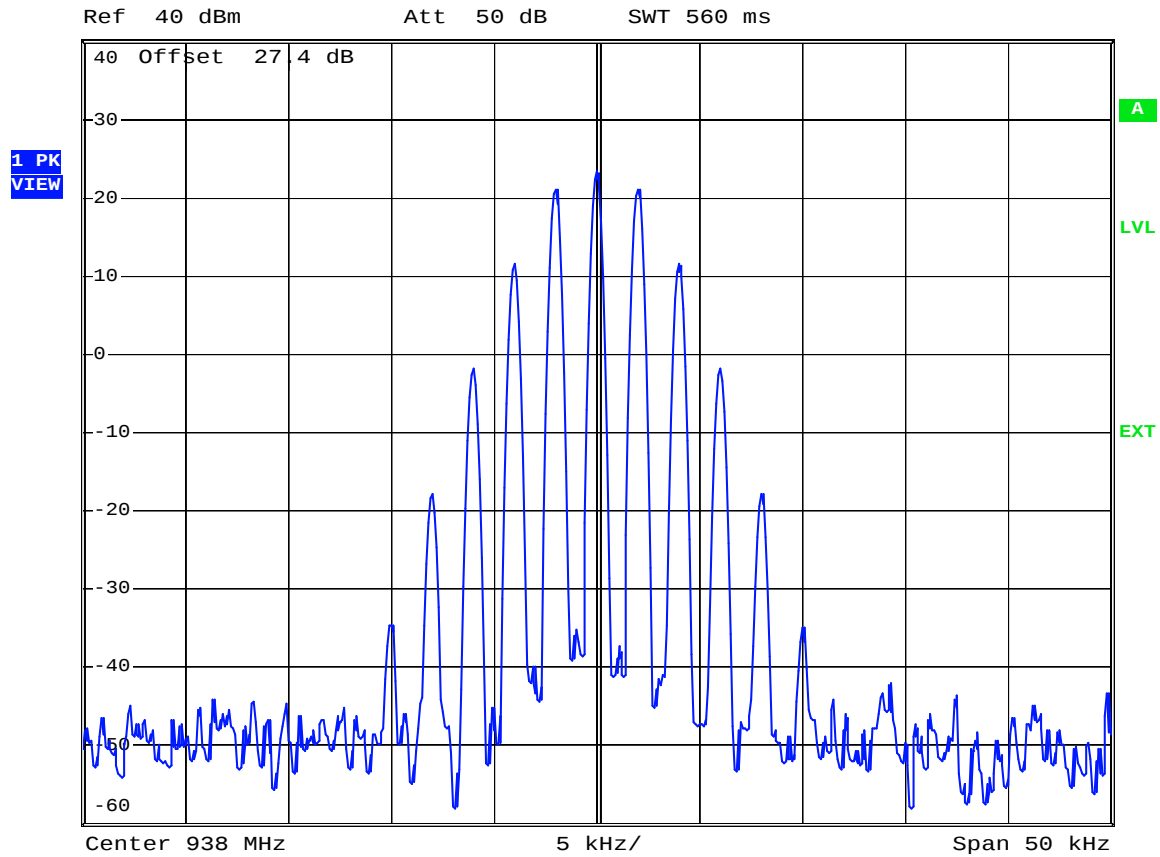
Date: 9.APR.2008 16:24:58

Test Data – Occupied Bandwidth

900 Analog - Output



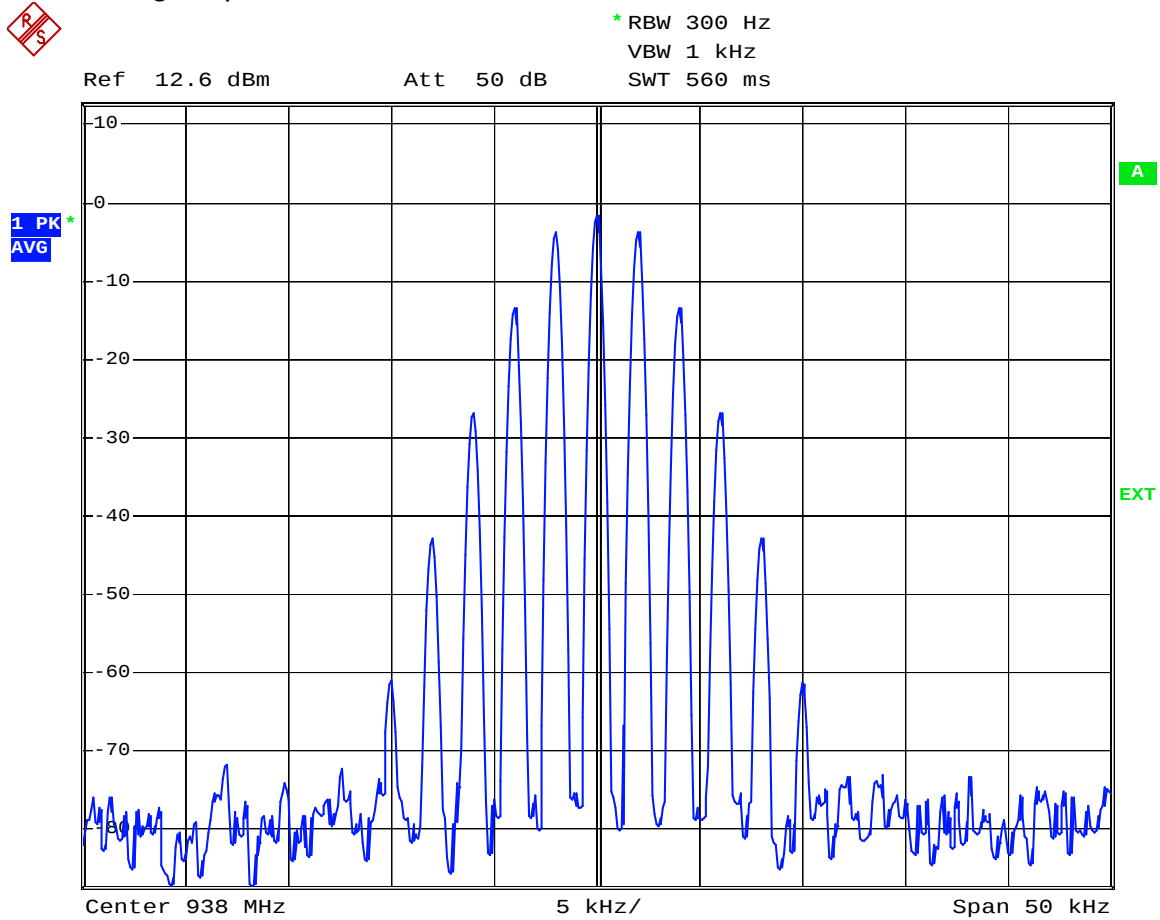
* RBW 300 Hz
VBW 1 kHz
SWT 560 ms



Date: 9.APR.2008 16:47:00

Test Data – Occupied Bandwidth

900 Analog - Input



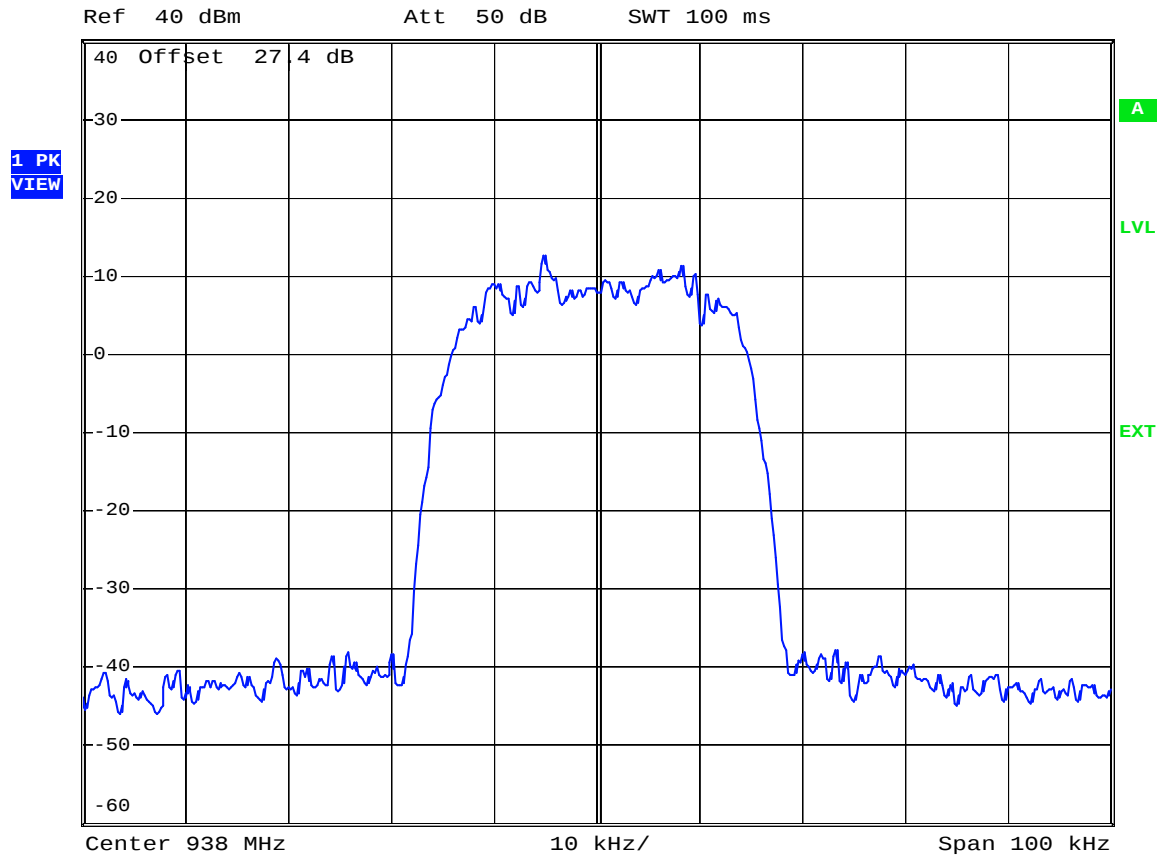
Date: 9.APR.2008 16:47:43

Test Data – Occupied Bandwidth

900 iDEN - Output



* RBW 1 kHz
VBW 3 kHz
SWT 100 ms



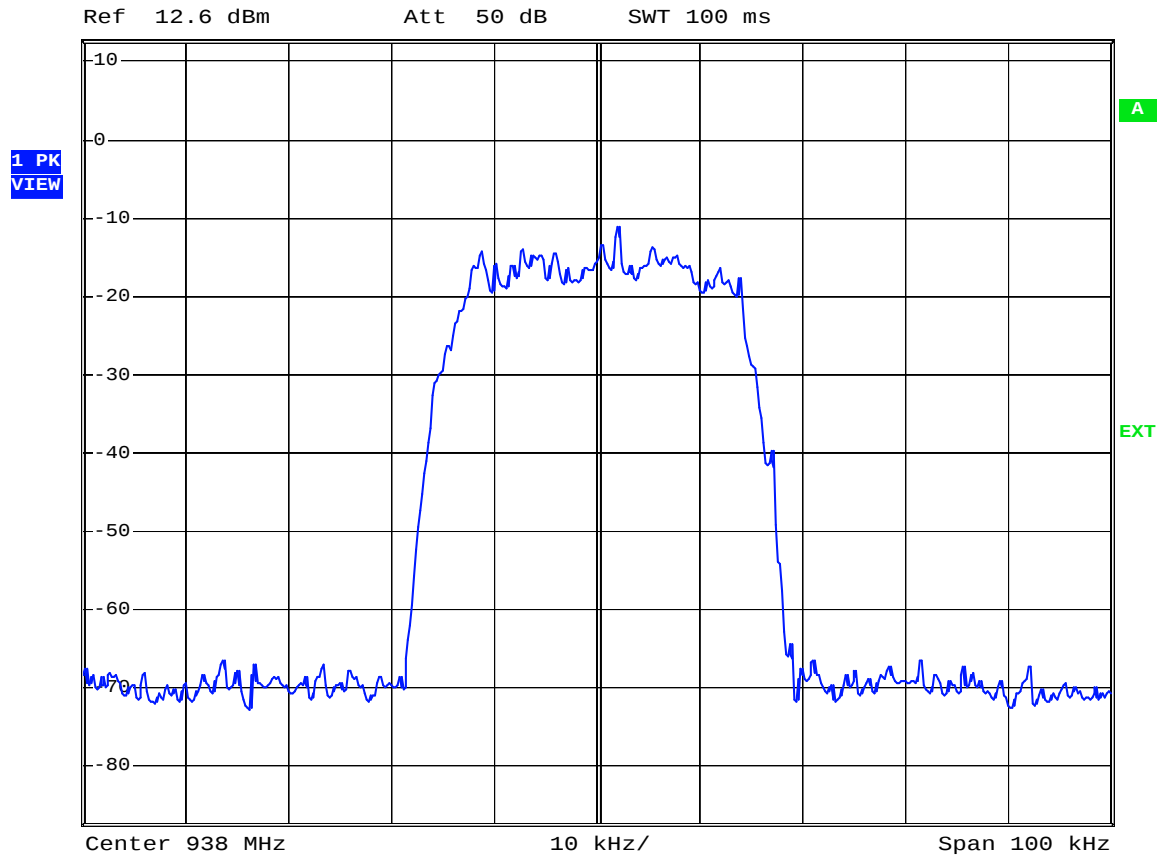
Date: 9.APR.2008 17:00:30

Test Data – Occupied Bandwidth

900 iDEN - Input



* RBW 1 kHz
VBW 3 kHz
SWT 100 ms



Date: 9.APR.2008 17:01:32

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.991
TESTED BY: David Light	DATE: 09 April 2008

Test Results: Complies.

Test Data: See attached plot(s).

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

Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 35 %

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

800 Analog



* RBW 1 kHz

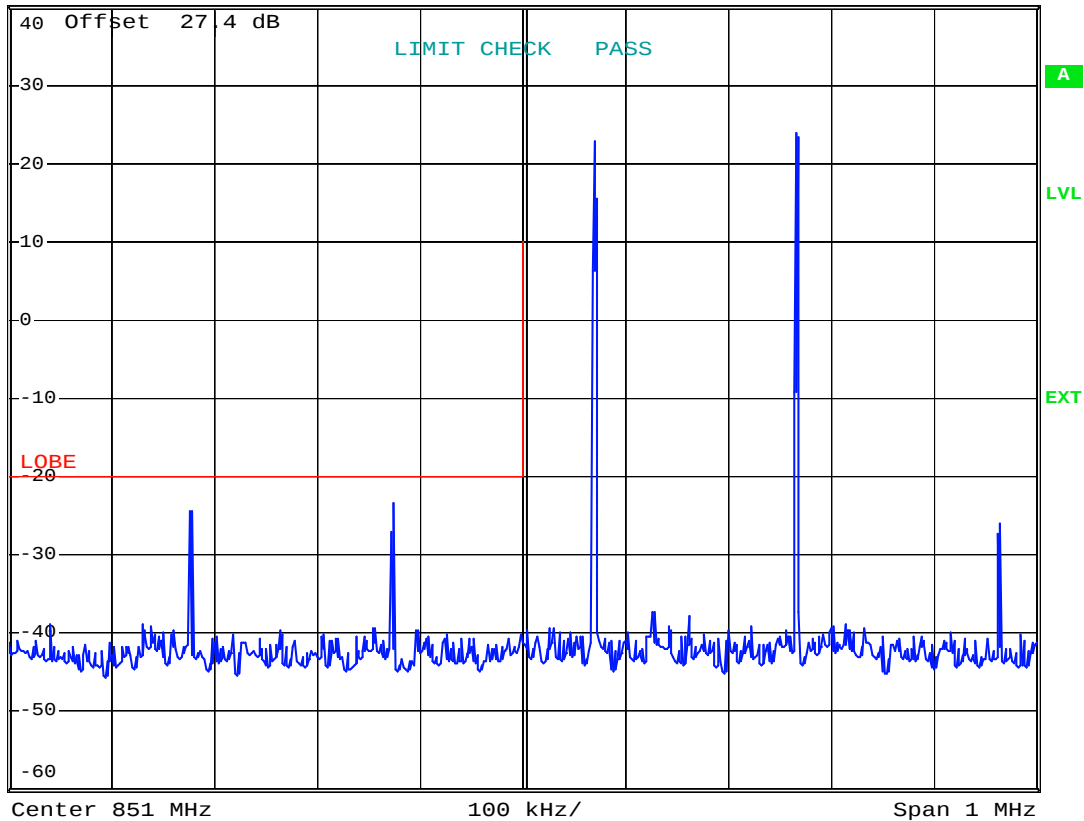
VBW 3 kHz

SWT 1 s

Ref 40 dBm

Att 50 dB

1 PK
VIEW



Date: 9.APR.2008 16:35:55

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation

800 Analog



* RBW 1 kHz

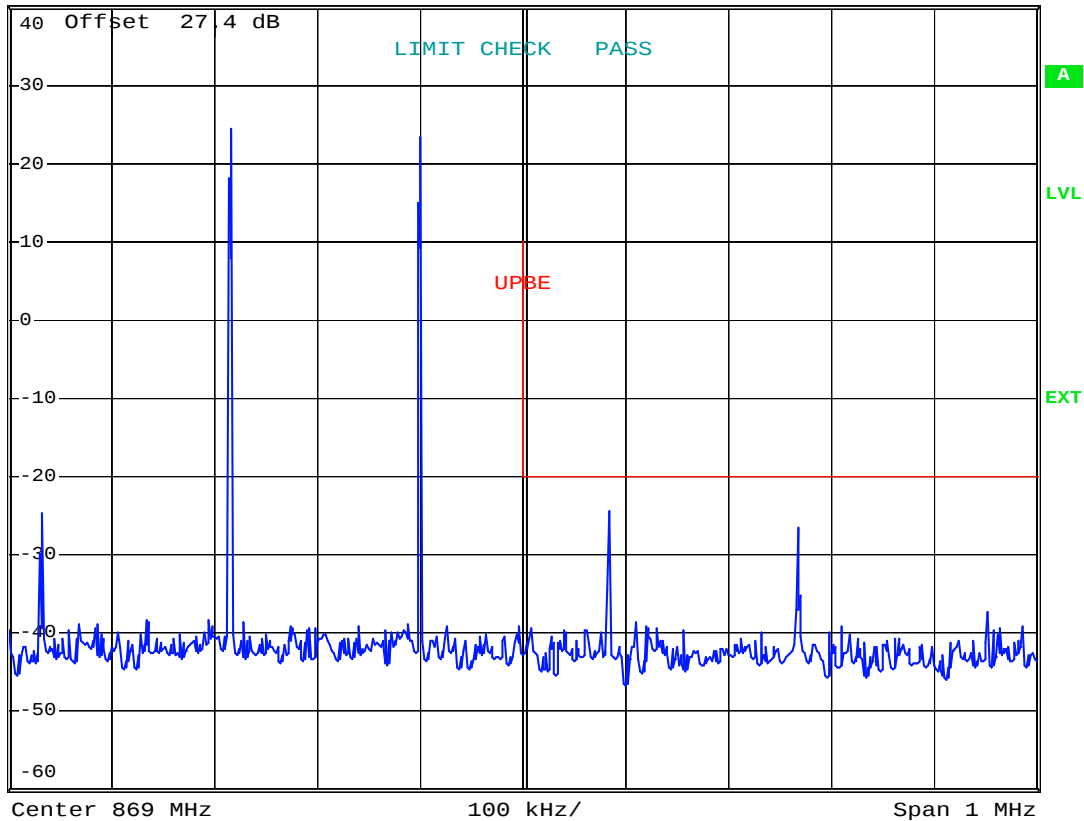
VBW 3 kHz

SWT 1 s

Ref 40 dBm

Att 50 dB

1 PK
VIEW

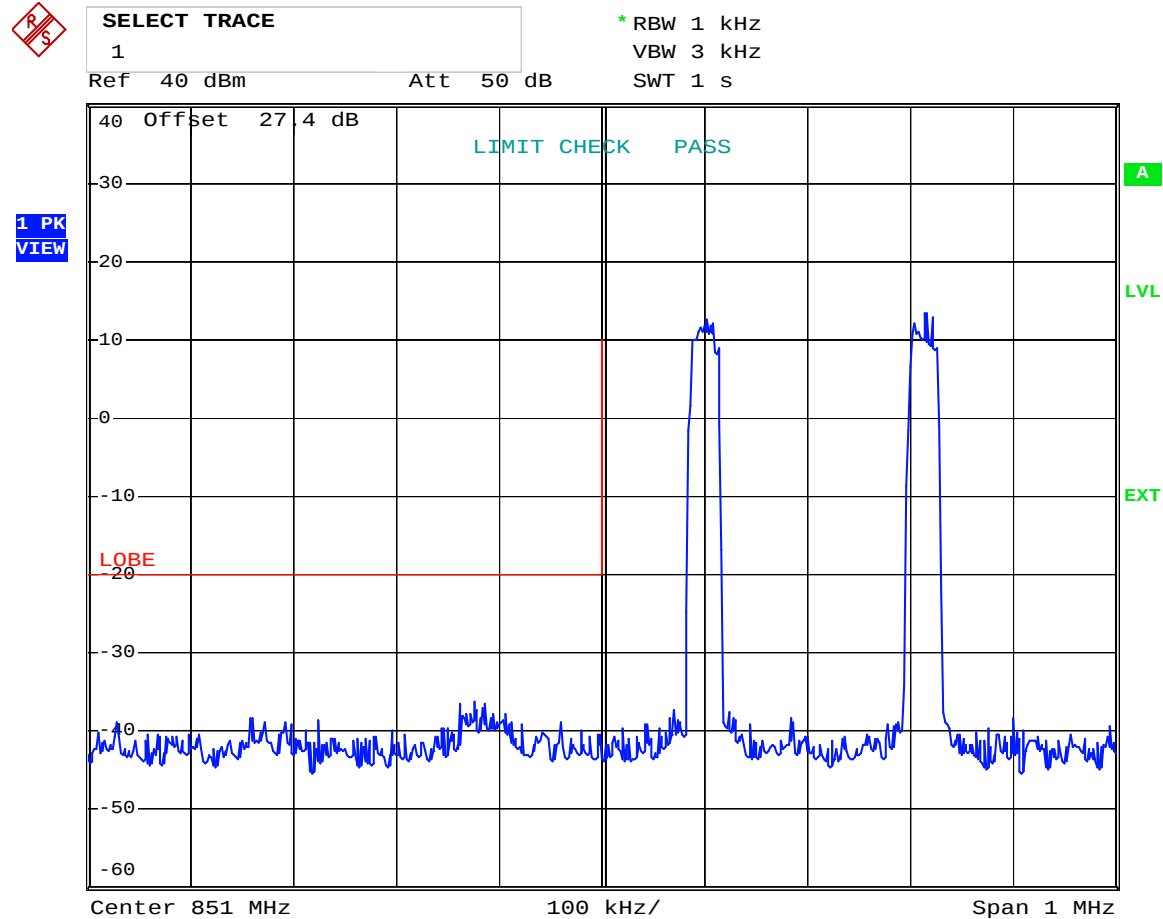


Date: 9.APR.2008 16:33:29

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

800 iDEN



Date: 9.APR.2008 16:28:58

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation

800 iDEN



* RBW 1 kHz

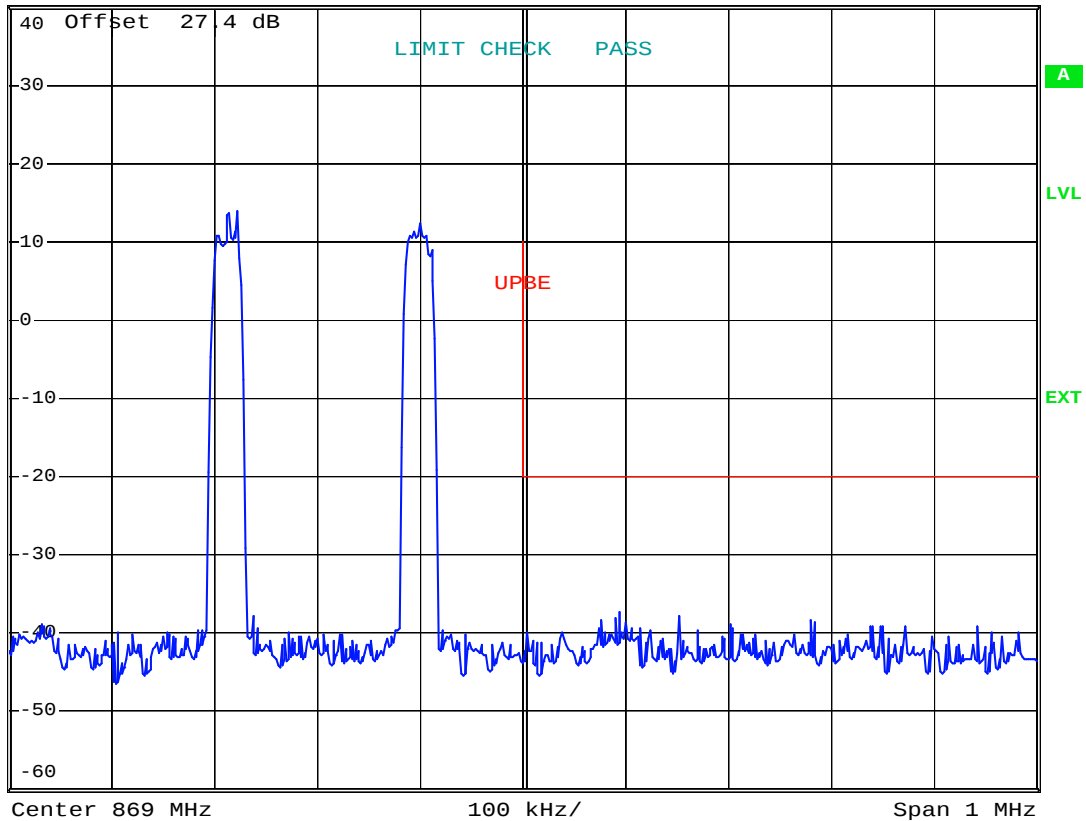
VBW 3 kHz

SWT 1 s

Ref 40 dBm

Att 50 dB

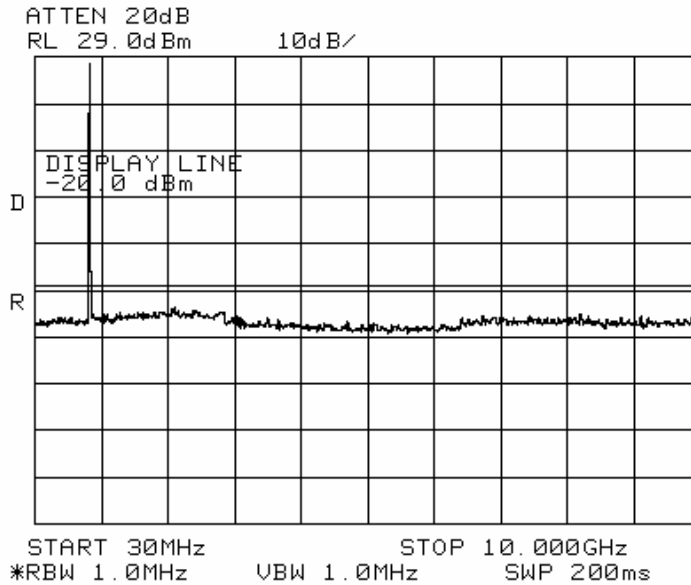
1 PK
VIEW



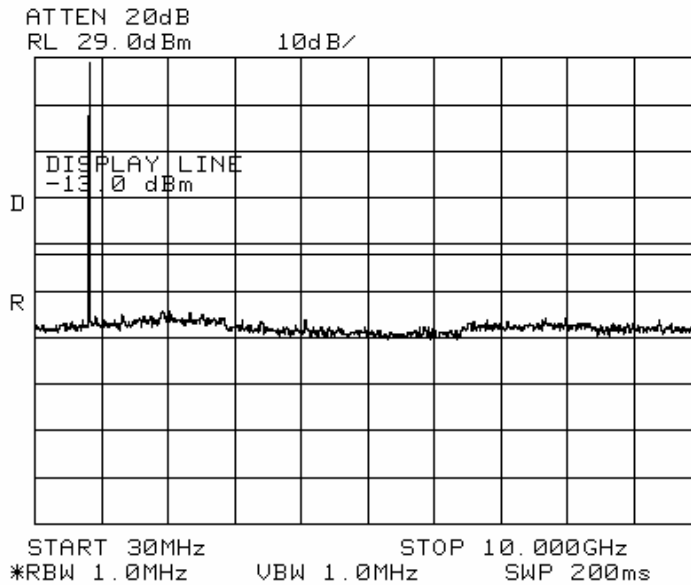
Date: 9.APR.2008 16:30:27

Test Data – Spurious Emissions at Antenna Terminals

Spurs – 800 Analog



Spurs – 800 iDEN



Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

900 Analog



* RBW 1 kHz

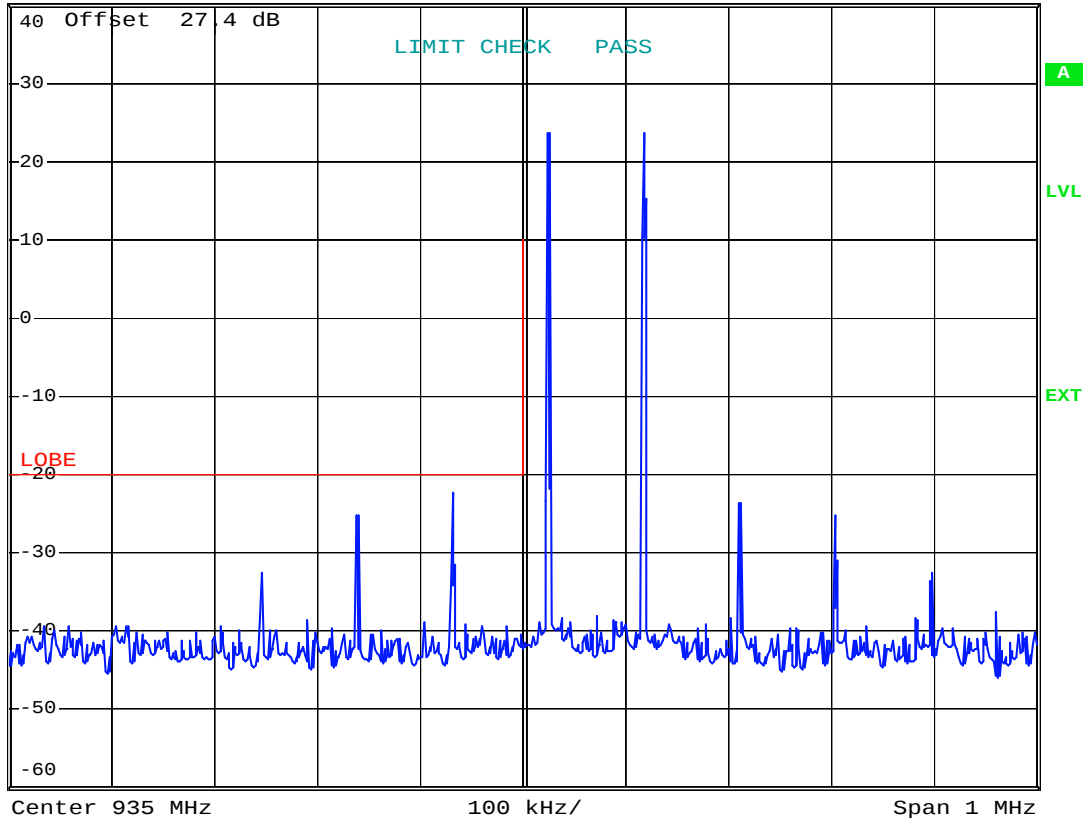
VBW 3 kHz

SWT 1 s

Ref 40 dBm

Att 50 dB

1 PK
MAXH



Date: 9.APR.2008 16:50:23

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation

900 Analog



* RBW 1 kHz

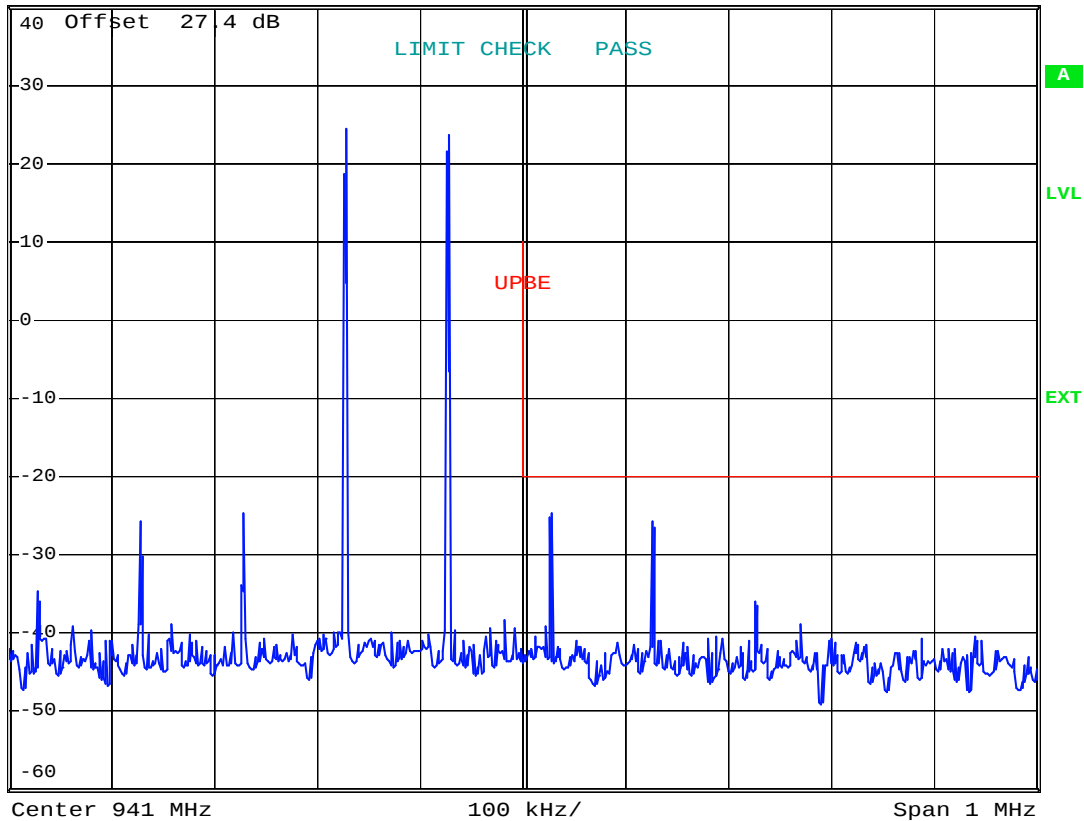
VBW 3 kHz

SWT 1 s

Ref 40 dBm

Att 50 dB

1 PK
VIEW



Date: 9.APR.2008 16:52:10

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

900 iDEN



* RBW 1 kHz

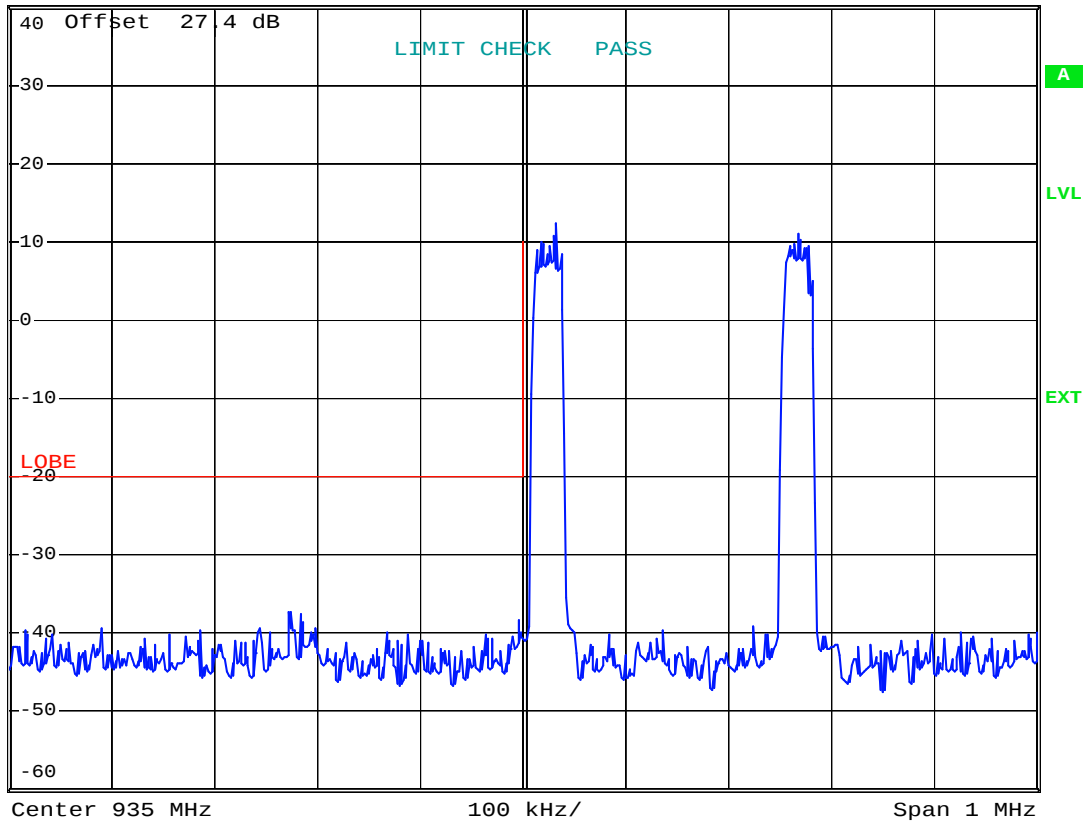
VBW 3 kHz

SWT 1 s

Ref 40 dBm

Att 50 dB

1 PK
VIEW



Date: 9.APR.2008 16:59:38

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation

900 iDEN



* RBW 1 kHz

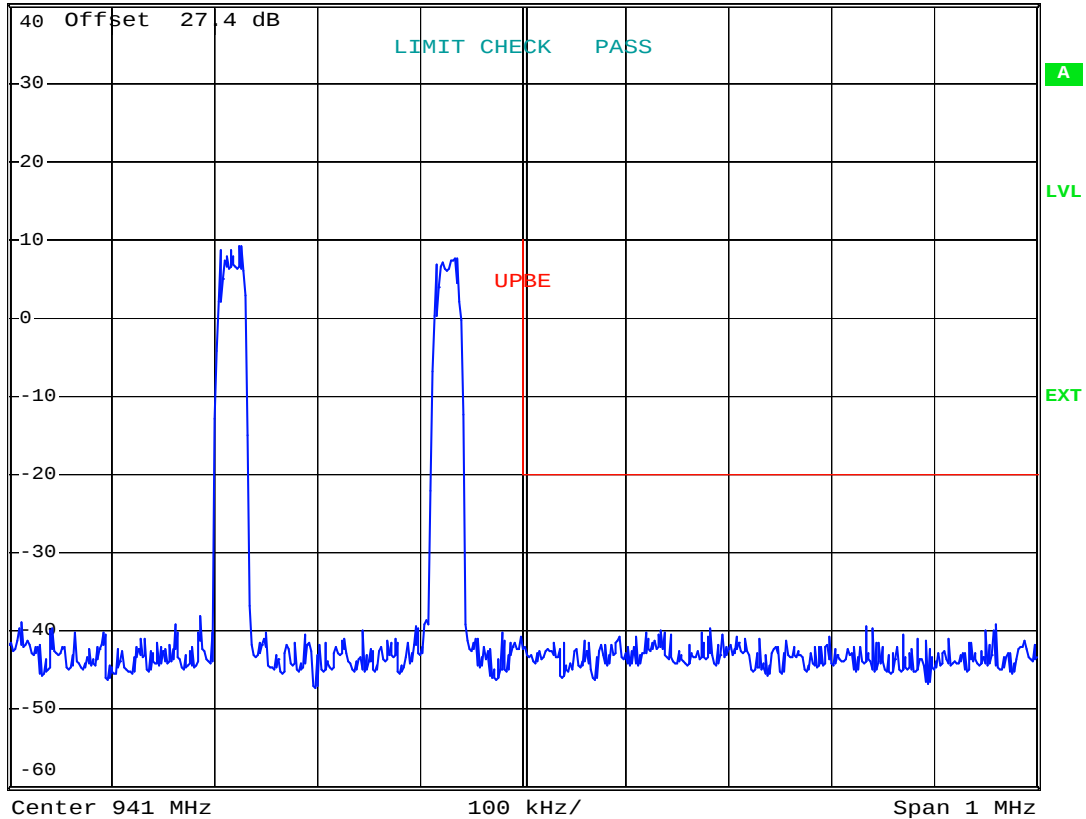
VBW 3 kHz

SWT 1 s

Ref 40 dBm

Att 50 dB

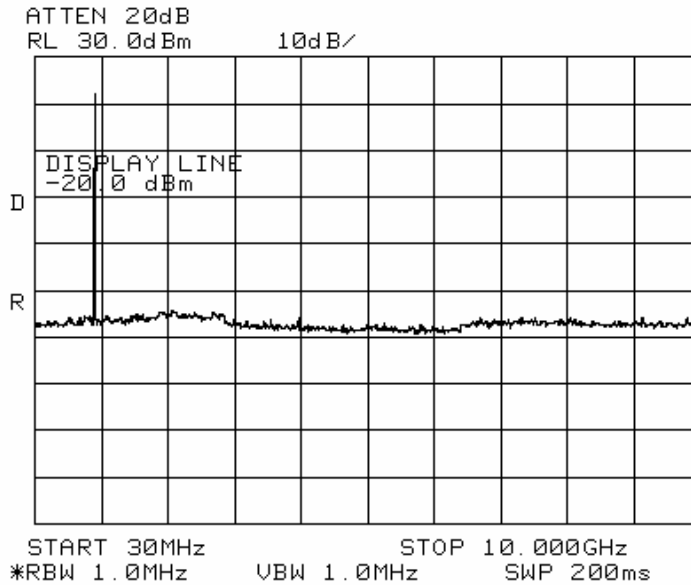
1 PK
VIEW



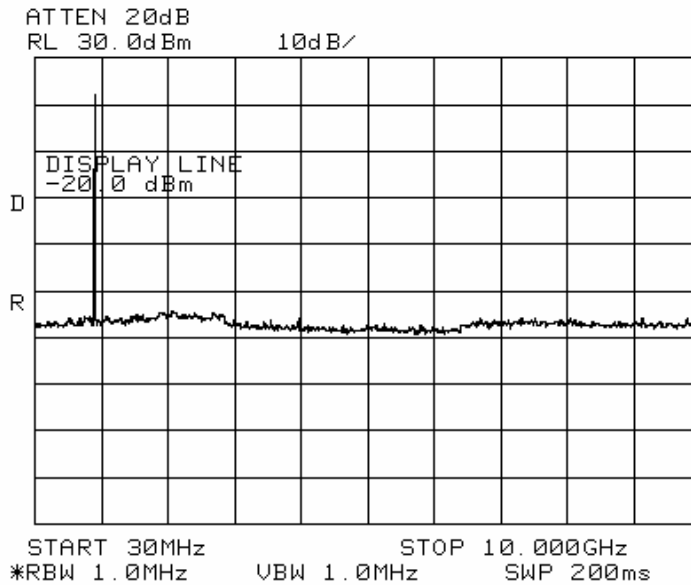
Date: 9.APR.2008 16:58:19

Test Data – Spurious Emissions at Antenna Terminals

Spurs – 900 Analog



Spurs – 900 iDEN



Section 6. Field Strength of Spurious Emissions

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.993
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: 1464-1484-1485-993-1016**Measurement Uncertainty:** +/-1.7 dB**Temperature:** 20 °C
35**Relative Humidity:** %**Note:** See page A5 for applicable limit.

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 METHODOLOGIES

NAME OF TEST: RF Power Output

PARA. NO.: 2.985

Minimum Standard: Para. No. 90.205(a). The maximum allowable station ERP is dependent upon the stations HAAT and required service area and will be authorized in accordance with Table 1 of 90.205(d).

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 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: Spurious Emissions at Antenna
Terminals

PARA. NO.: 2.991

Minimum Standard:

90.210, Table 1

Table 1

Frequency Band (MHz)	Mask for equipment with Low Pass Filter	Mask for equipment without Low Pass Filter
Below 25	A or B	A or C
25 - 50	B	C
72 - 76	B	C
150 - 174	B, D or E	C, D or E
150 Paging only	B	C
220 - 222	F	F
421 - 512	B, D or E	C, D or E
450 paging only	B	H
806 - 821/ 851 - 866	B	G
821 - 824/ 866 - 869	B	H
896 - 901/ 935 - 940	I	J
902 - 928	K	K
929 - 930	B	G
Above 940	B	C
All other bands	B	C

MASK	Spurious Limit	FS Limit Below 1 GHz	FS Limit Above 1 GHz
A,B,C,G,H,I	-13dBm	84.4 dB μ V/m@3m	82.2 dB μ V/m@3m
D,J	-20dBm	77.4 dB μ V/m@3m	75.2 dB μ V/m@3m
E,F,K	-25dBm	72.4 dB μ V/m@3m	70.2 dB μ V/m@3m

Test Method:

RBW: 1% of emission bandwidth in the 0 - 1 GHz range.
1 MHz at frequencies above 1 GHz.VBW: $\Rightarrow$ RBW

The spectrum is searched up to 10 times the fundamental frequency.

EQUIPMENT: ION-B TFAM80/92/19EP

PROJECT NO.: 12250RUS2

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.989
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Minimum Standard: Not defined. Input/Output

Method Of Measurement:

Analog

Spectrum analyzer settings:

RBW=VBW=300 Hz

Span: 100 kHz

Sweep: Auto

iDEN

RBW=VBW= 300 Hz

Span: 100 kHz

Sweep: Auto

NAME OF TEST: Field Strength of Spurious**PARA. NO.: 2.993****Minimum Standard:** Para. No. 90.210, see table 1 for applicable mask.**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.

MASK	Spurious Limit	FS Limit Below 1 GHz	FS Limit Above 1 GHz
A,B,C,G,H,I	-13dBm	84.4 dB μ V/m@3m	82.2 dB μ V/m@3m
D,J	-20dBm	77.4 dB μ V/m@3m	75.2 dB μ V/m@3m
E,F,K	-25dBm	72.4 dB μ V/m@3m	70.2 dB μ V/m@3m

NAME OF TEST: Frequency Stability**PARA. NO.: 2.995**

Minimum Standard: Para. No. 990.213. The transmitter carrier frequency shall remain

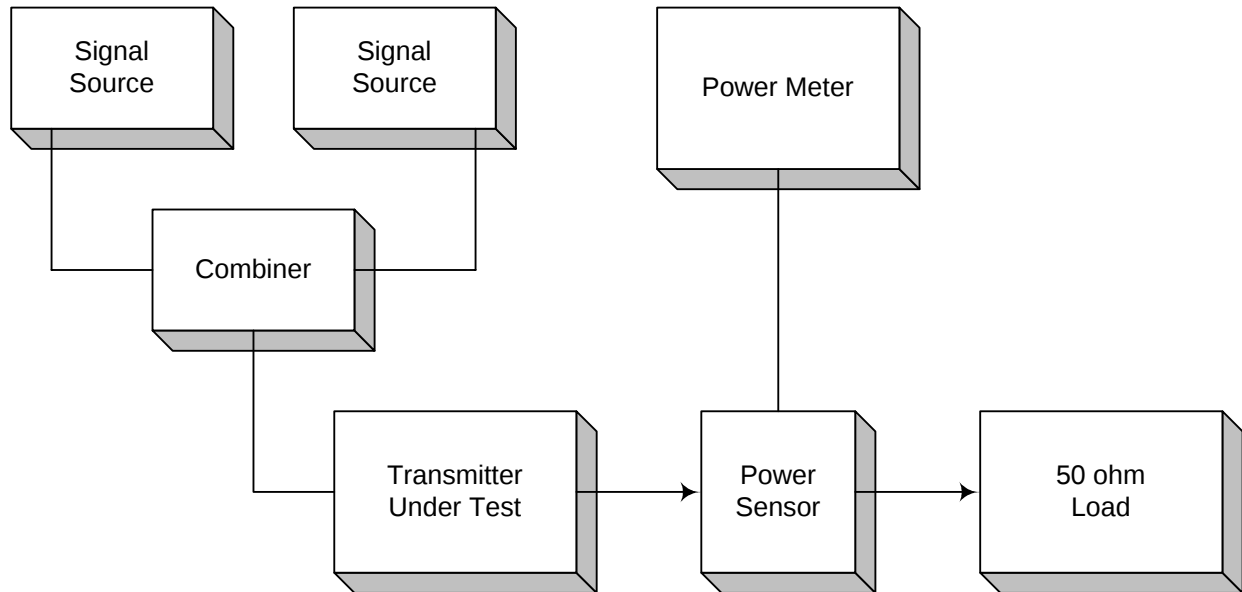
within the assigned frequency below in ppm.

Table 2

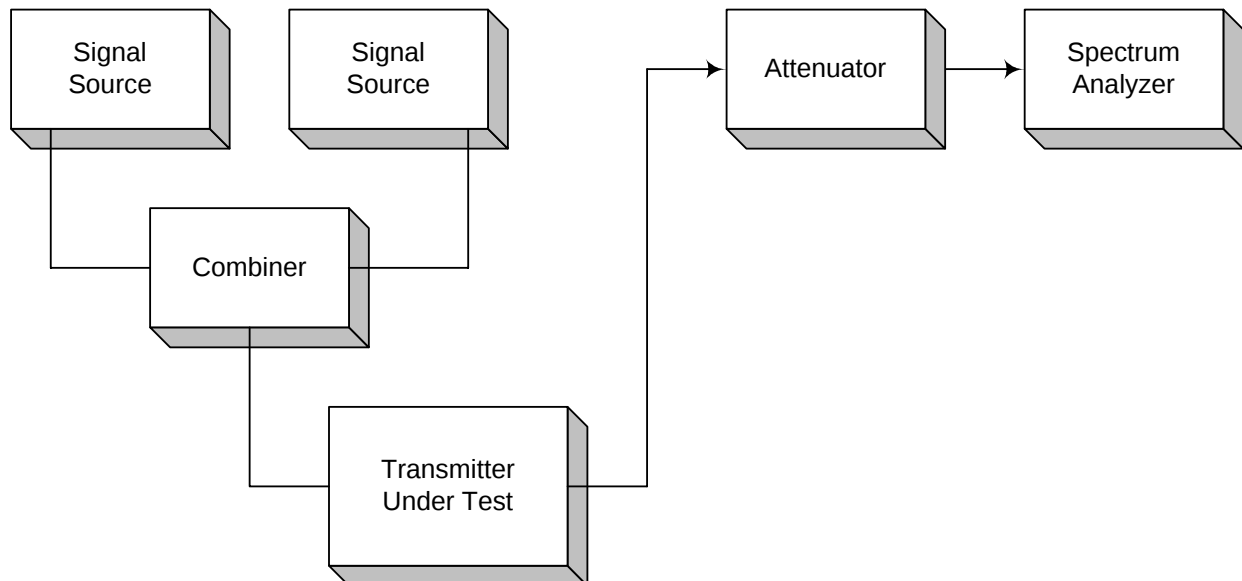
Frequency Band (MHz)	Fixed And Base Stations	Mobile Stations	
		> 2 Watts o/p pwr	< 2 Watts o/p pwr
Below 25	100	100	200
25 - 50	20	20	50
72 - 76	5	-	50
150 - 174	5	5	5
220 - 222	0.1	1.5	1.5
421 - 512	2.5	5	5
806 - 821	1.5	2.5	2.5
821 - 824	1.0	1.5	15
851 - 866	1.5	2.5	2.5
866 - 869	1.0	1.5	1.5
869 - 901	0.1	1.5	1.5
902 - 928	2.5	2.5	2.5
929 - 930	1.5	-	-
935 - 940	0.1	1.5	1.5
1427 - 1435	300	300	300
Above 2450	-	-	-

ANNEX B - TEST DIAGRAMS

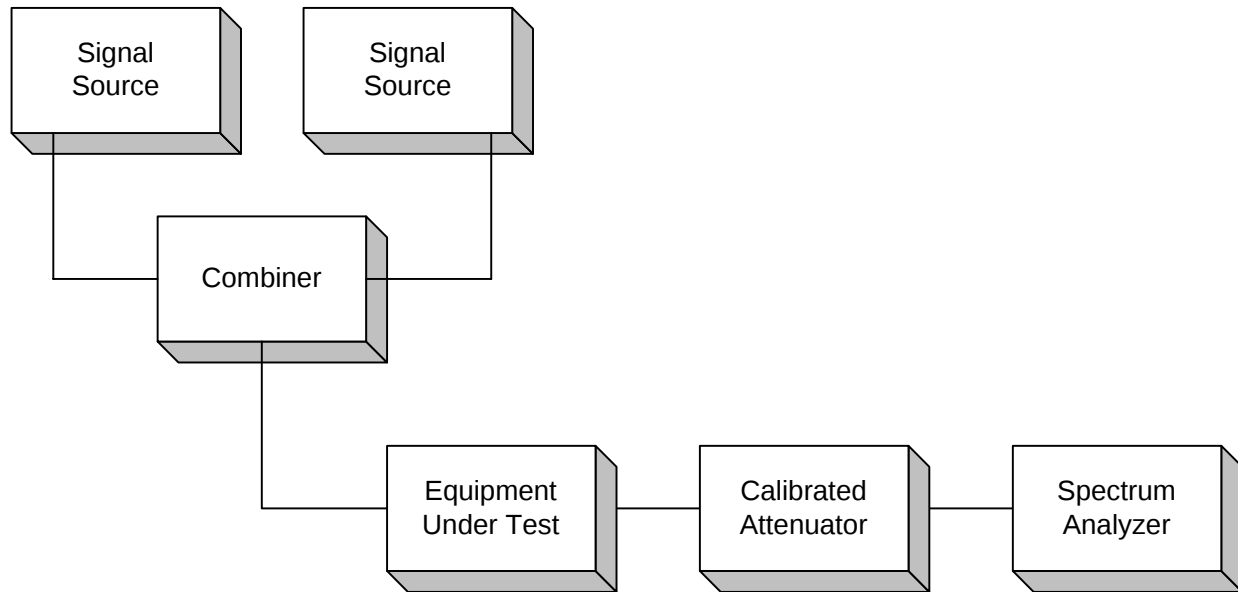
Para. No. 2.985 - R.F. Power Output



Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 - Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation

