



Nemko Test Report: 24844RUS1

Applicant: Andrew Corporation
620 N. Greenfield Parkway
Garner, NC 27529
USA

**Equipment Under Test:
(E.U.T.)** MR8018

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: 29 January, 2009

APPROVED BY:

A handwritten signature in black ink, appearing to read 'Tom Tidwell'.

Tom Tidwell, Telecom Direct

DATE: 29 January, 2009

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EQUIPMENT: MR8018

Section 1. Summary of Test Results

Manufacturer: Andrew Corporation

Model No.: MR8018

Serial No.: 7564432

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	90.635	1 kW ERP	Complies
Occupied Bandwidth	90.210	Input/Output	Complies
Spurious Emissions at Antenna Terminals	90.210	Plots	Complies
Field Strength of Spurious Emissions	90.210	-20 dBm 50 + 10logP(W)	Complies
Frequency Stability	90.213	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**Transmitter**

Supply Voltage Input: 120 Vac

Frequency Range: Downlink: 851 to 869 MHz

Uplink: 806 to 824 MHz

Tunable Bands:

Type(s) of Modulation:	F3E (Voice)	F1D	F2D	D7W (QAM)	Other
	☒	☒	☐	☒	☐

Gain: 70 dB

Output Impedance: 50 ohms

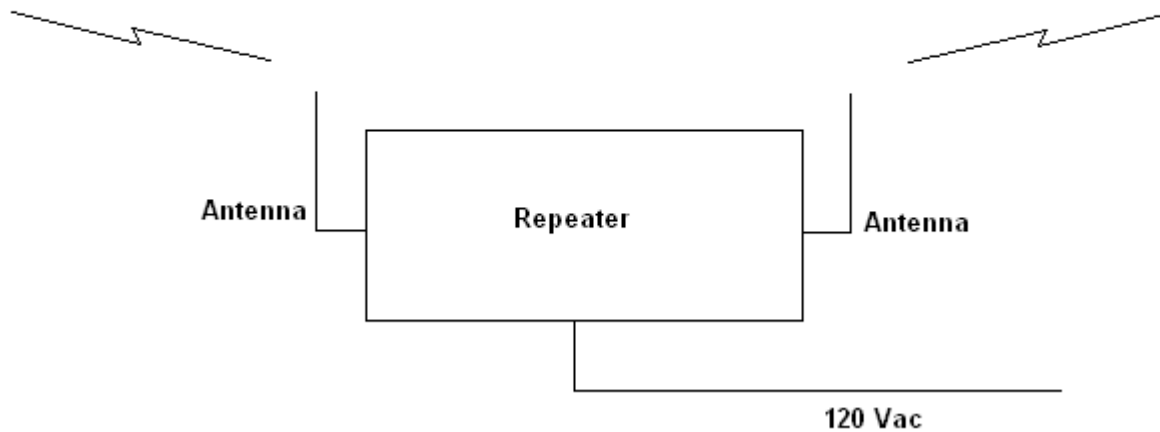
RF Power Output (rated): $\frac{0.158}{22}$ W dBmOperator Selection of
Operating Frequency: SoftwarePower Output Adjustment
Capability: Software

Frequency Translation:	F1-F1	F1-F2	N/A
	☒	☐	☐

Band Selection:	Software	Duplexer Change	Fullband Coverage
	☒	☐	☐

Description of EUT

The miniRepeaters are bi-directional amplifiers used to enhance signals between a mobile and a base station in a wireless network. They have been designed to increase signal strength in small and medium sized areas such as offices, shops, basements and manufacturing facilities.

System Diagram

Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.985
TESTED BY: David Light	DATE: 29 January 2009

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

Direction	Modulation	Output per Channel (dBm)	Composite Power (dBm)	Composite Power (W)
Uplink	Analog	19	22	0.158
Downlink	Analog	19	22	0.158
Uplink	iDEN	19	22	0.158
Downlink	iDEN	19	22	0.158

Equipment Used: 1659-1082-1472**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: 29 January 2009

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1659-1082-1472

Measurement Uncertainty: 1X10⁻⁷ ppm

Temperature: 22 °C

Relative Humidity: 35 %

EQUIPMENT: MR8018

Test Data – Occupied Bandwidth

Analog - Output

Downlink

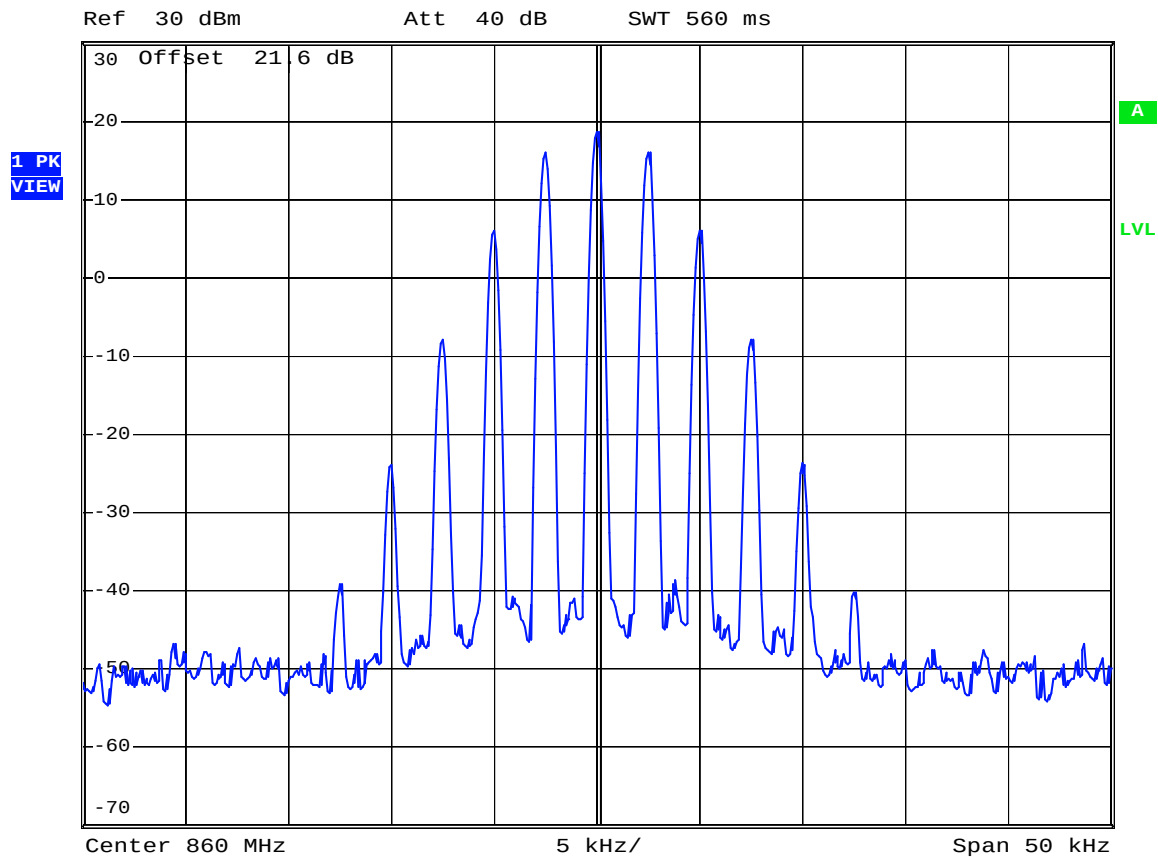
2.5 kHz Tone / 3 kHz Deviation



* RBW 300 Hz

VBW 1 kHz

SWT 560 ms



Date: 29.JAN.2009 10:06:26

EQUIPMENT: MR8018

Test Data – Occupied Bandwidth

Analog - Input

Downlink

2.5 kHz Tone / 3 kHz Deviation



* RBW 300 Hz

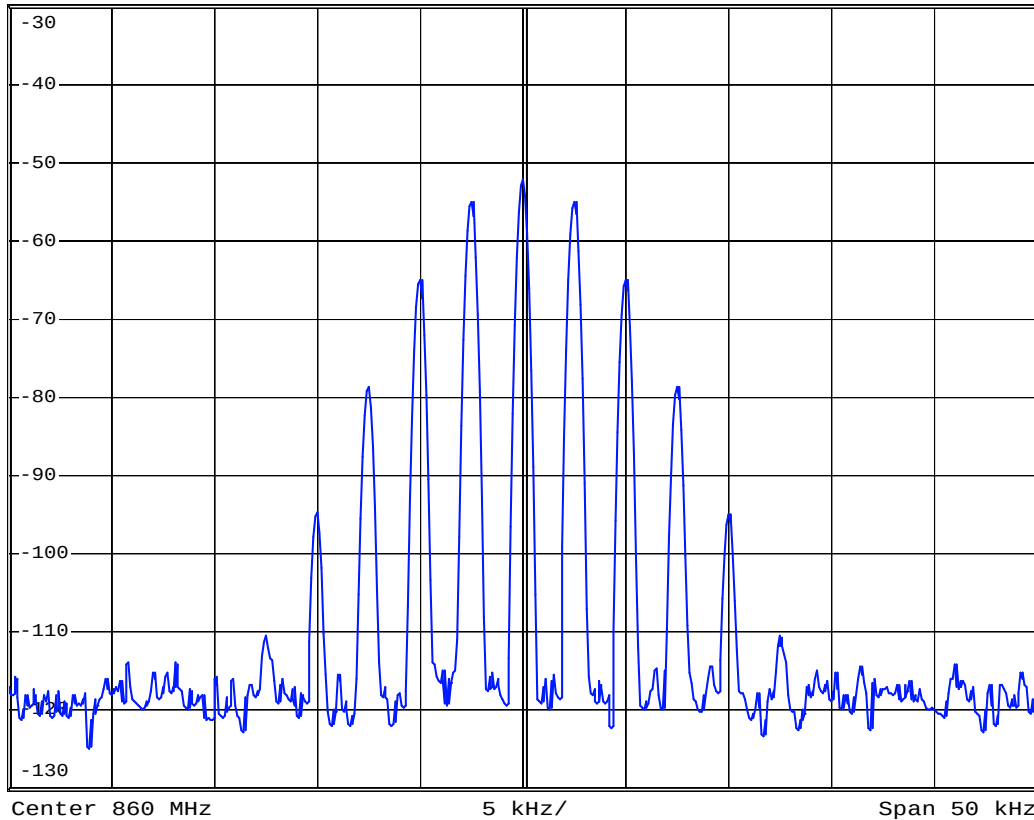
VBW 1 kHz

SWT 560 ms

Ref -30 dBm

Att 10 dB

1 PK
VIEW



Date: 29.JAN.2009 10:07:43

EQUIPMENT: MR8018

Test Data – Occupied Bandwidth

Analog – Output

Uplink

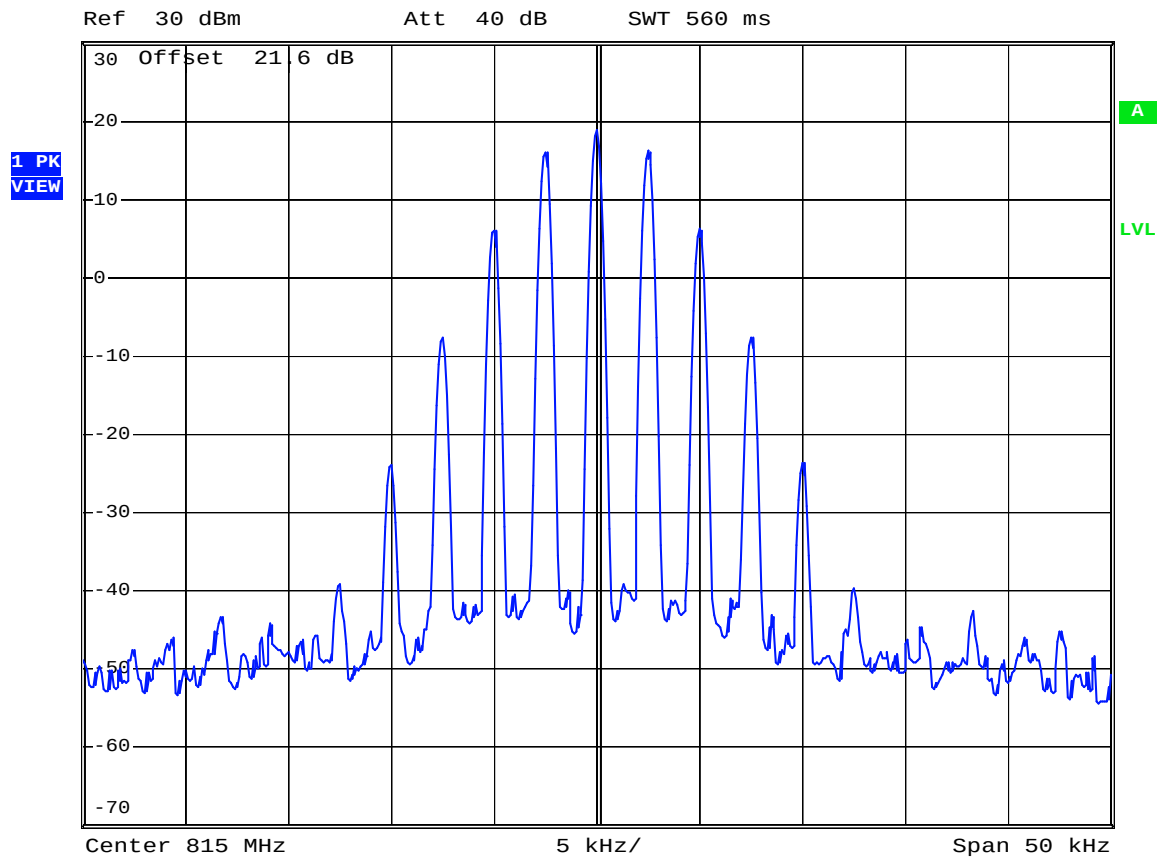
2.5 kHz Tone / 3 kHz Deviation



* RBW 300 Hz

VBW 1 kHz

SWT 560 ms



Date: 29.JAN.2009 09:54:57

EQUIPMENT: MR8018

Test Data – Occupied Bandwidth

Analog - Input

Uplink

2.5 kHz Tone / 3 kHz Deviation



* RBW 300 Hz

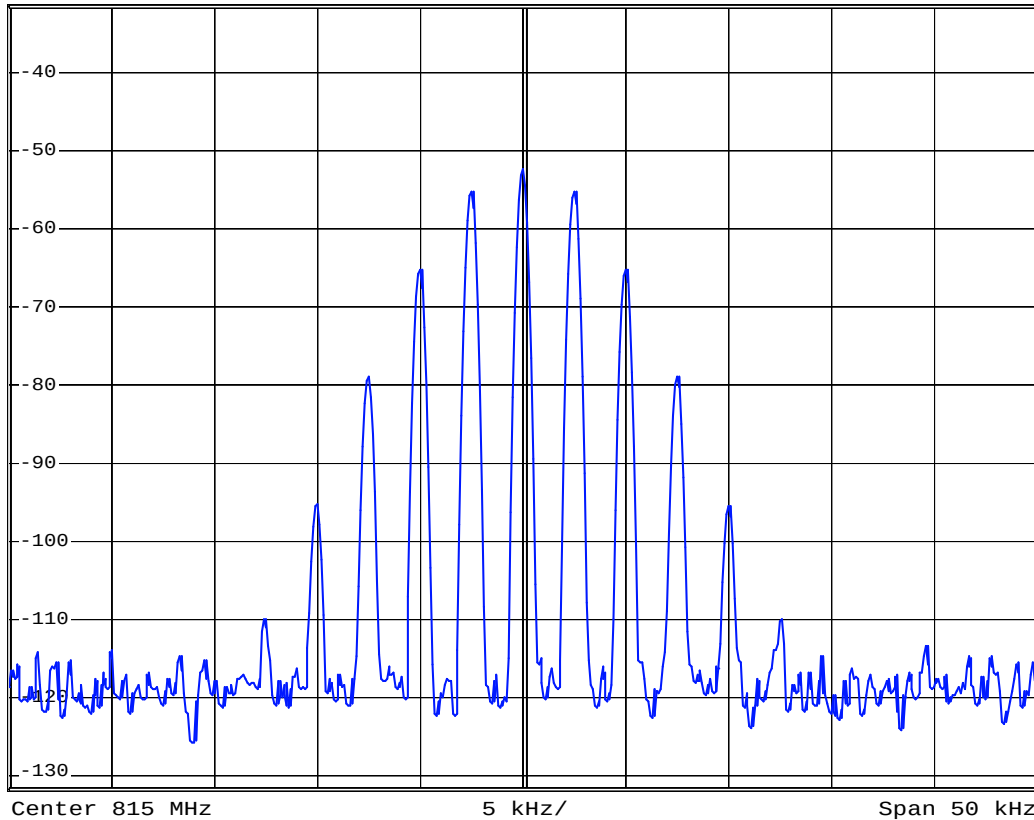
VBW 1 kHz

SWT 560 ms

Ref -31.6 dBm

Att 10 dB

1 PK
VIEW



Date: 29.JAN.2009 09:56:11

EQUIPMENT: MR8018

Test Data – Occupied Bandwidth

iDEN - Output

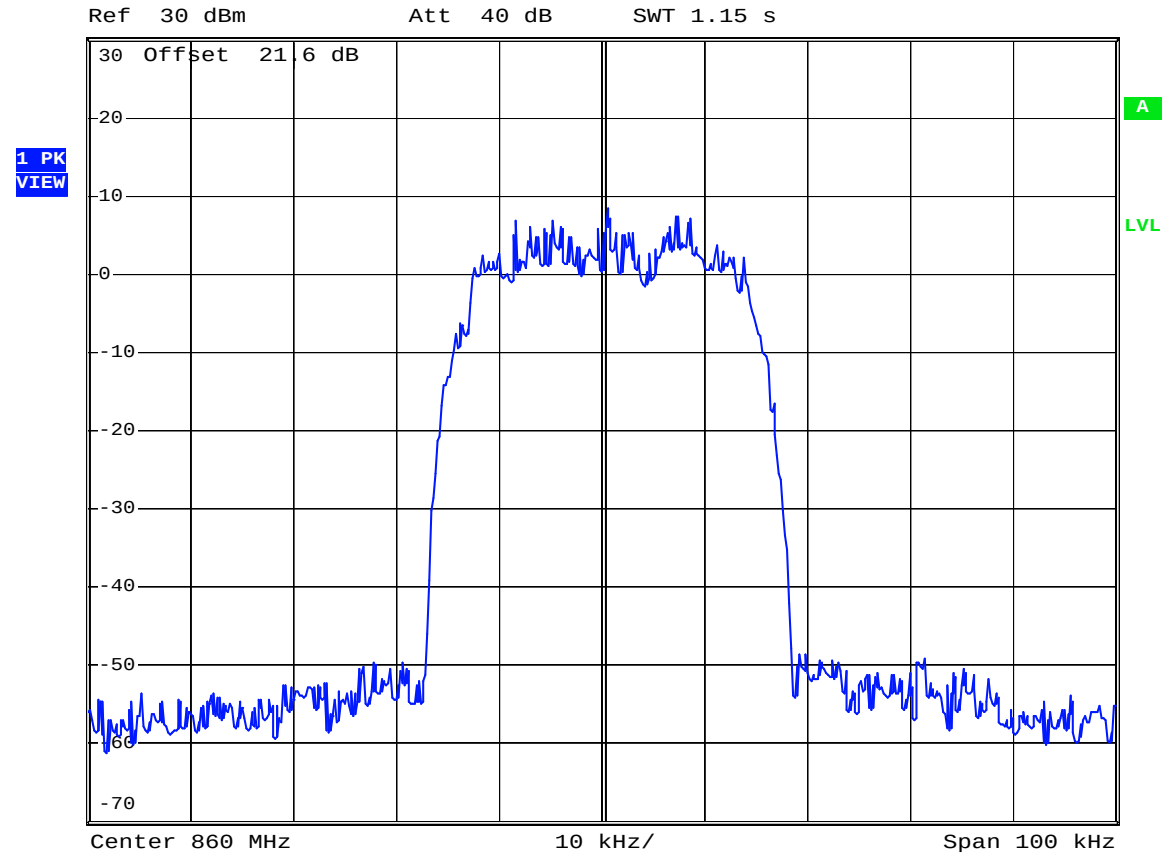
Downlink



* RBW 300 Hz

VBW 1 kHz

SWT 1.15 s



Date: 29.JAN.2009 09:23:25

EQUIPMENT: MR8018

Test Data – Occupied Bandwidth

iDEN - Input

Downlink



* RBW 300 Hz

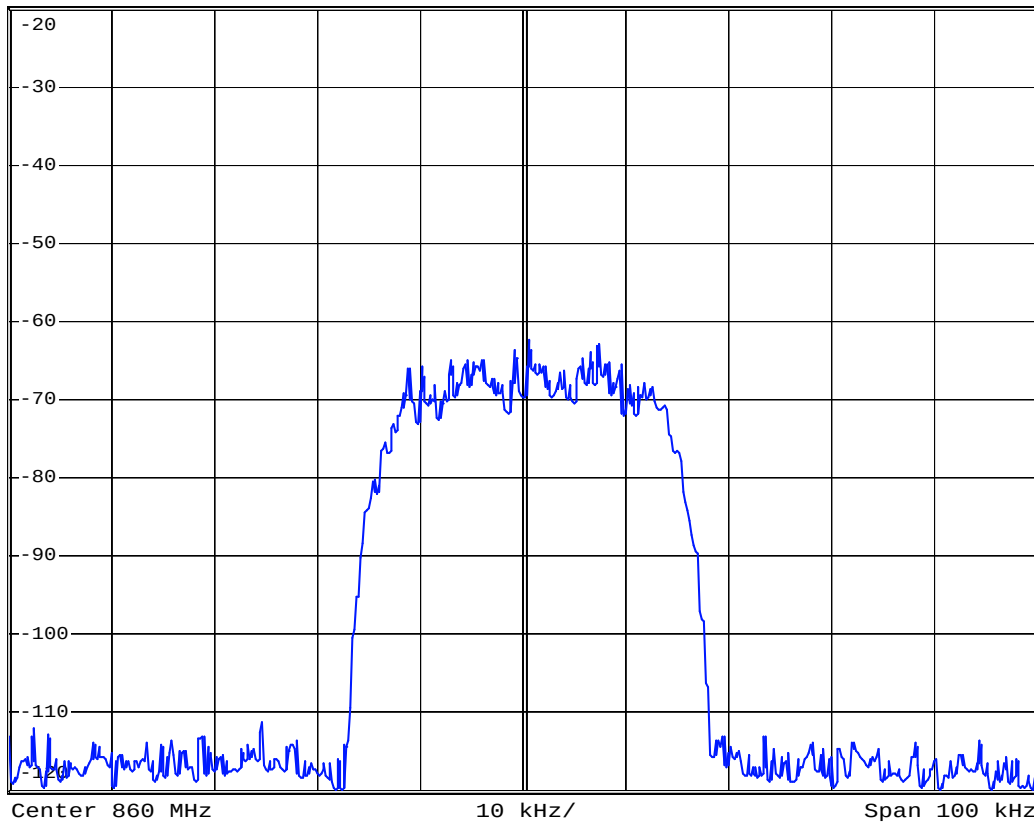
VBW 1 kHz

SWT 1.15 s

Ref -20 dBm

Att 10 dB

1 PK
VIEW



Date: 29.JAN.2009 09:26:05

EQUIPMENT: MR8018

Test Data – Occupied Bandwidth

iDEN - Output

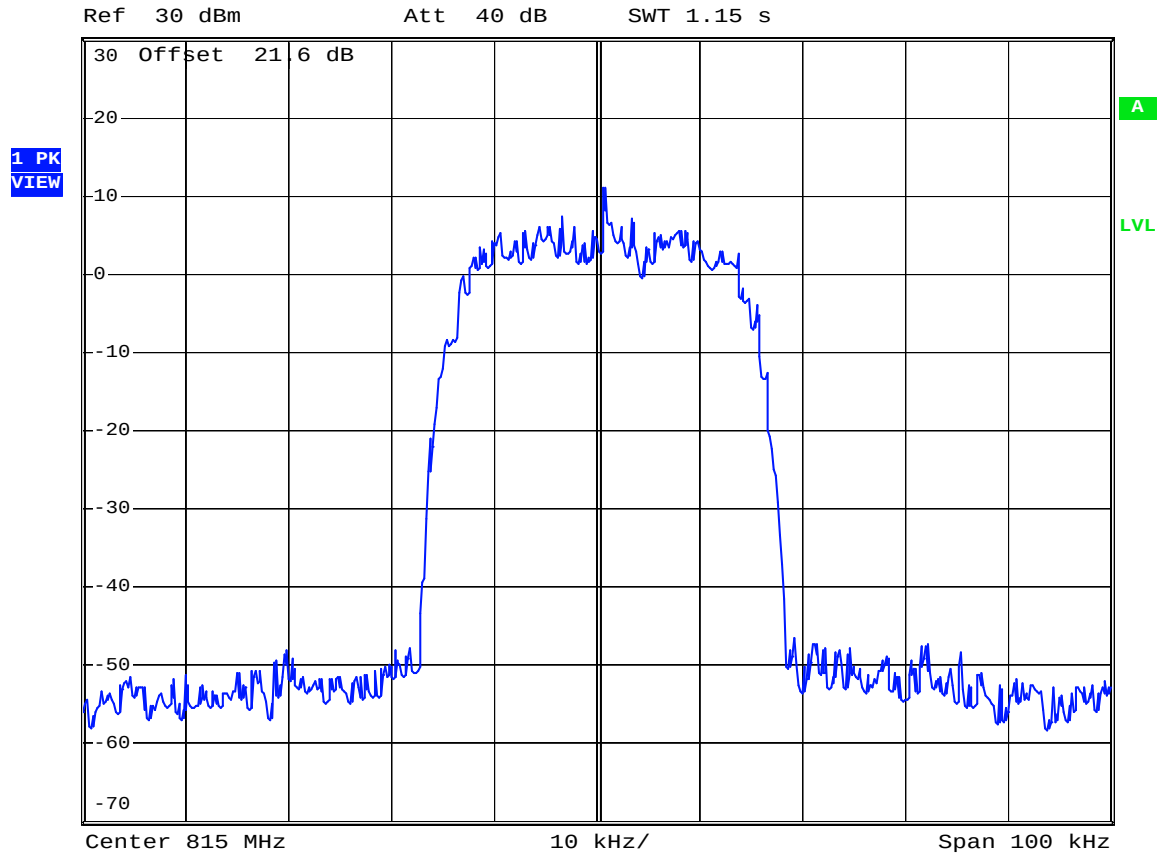
Uplink



* RBW 300 Hz

VBW 1 kHz

SWT 1.15 s



Date: 29.JAN.2009 09:37:37

EQUIPMENT: MR8018

Test Data – Occupied Bandwidth

iDEN - Input

Uplink



* RBW 300 Hz

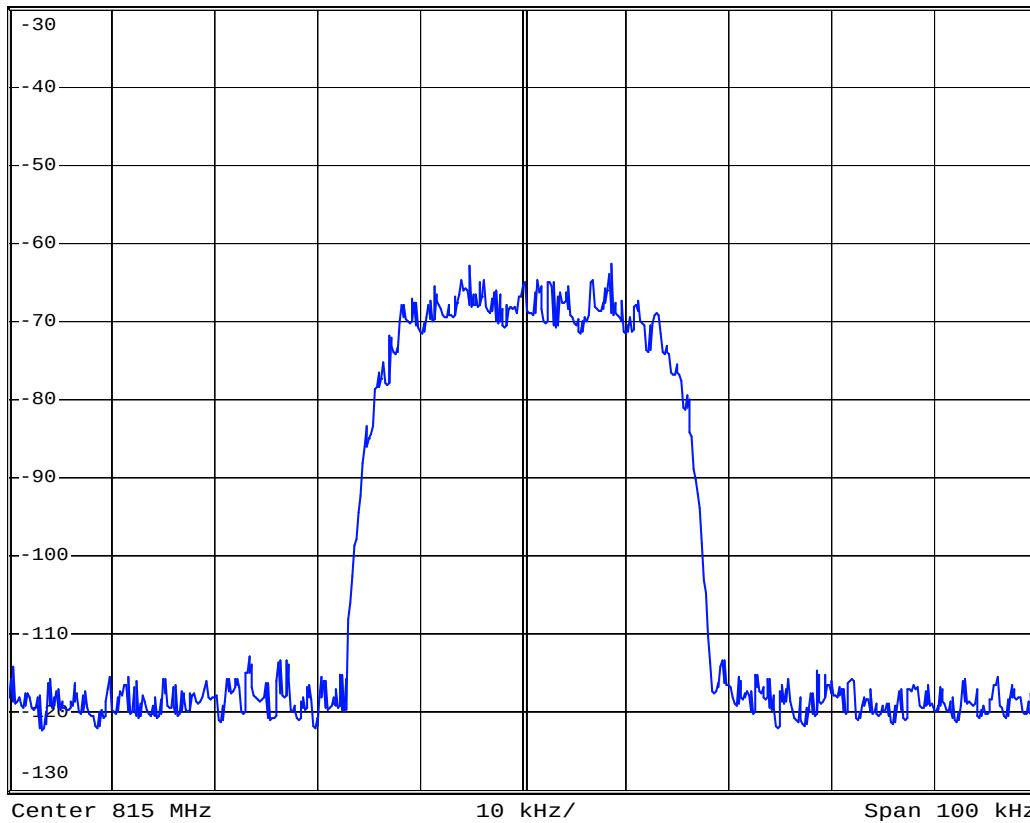
VBW 1 kHz

SWT 1.15 s

Ref -30 dBm

Att 10 dB

1 PK
VIEW



Date: 29.JAN.2009 09:39:04

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.991
TESTED BY: David Light	DATE: 29 January 2009

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1659-1082-1472-1464

Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 35 %

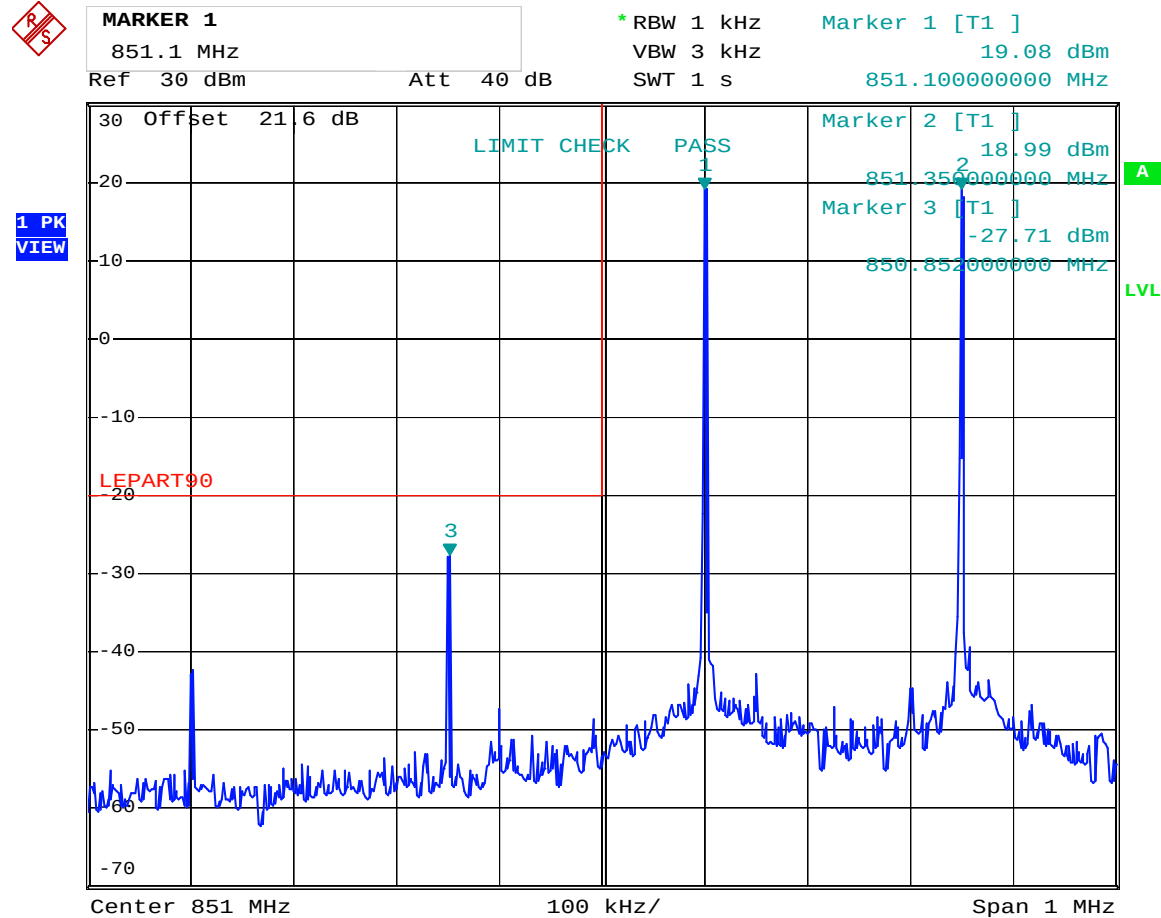
EQUIPMENT: MR8018

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

Analog

Downlink



Date: 29.JAN.2009 10:03:12

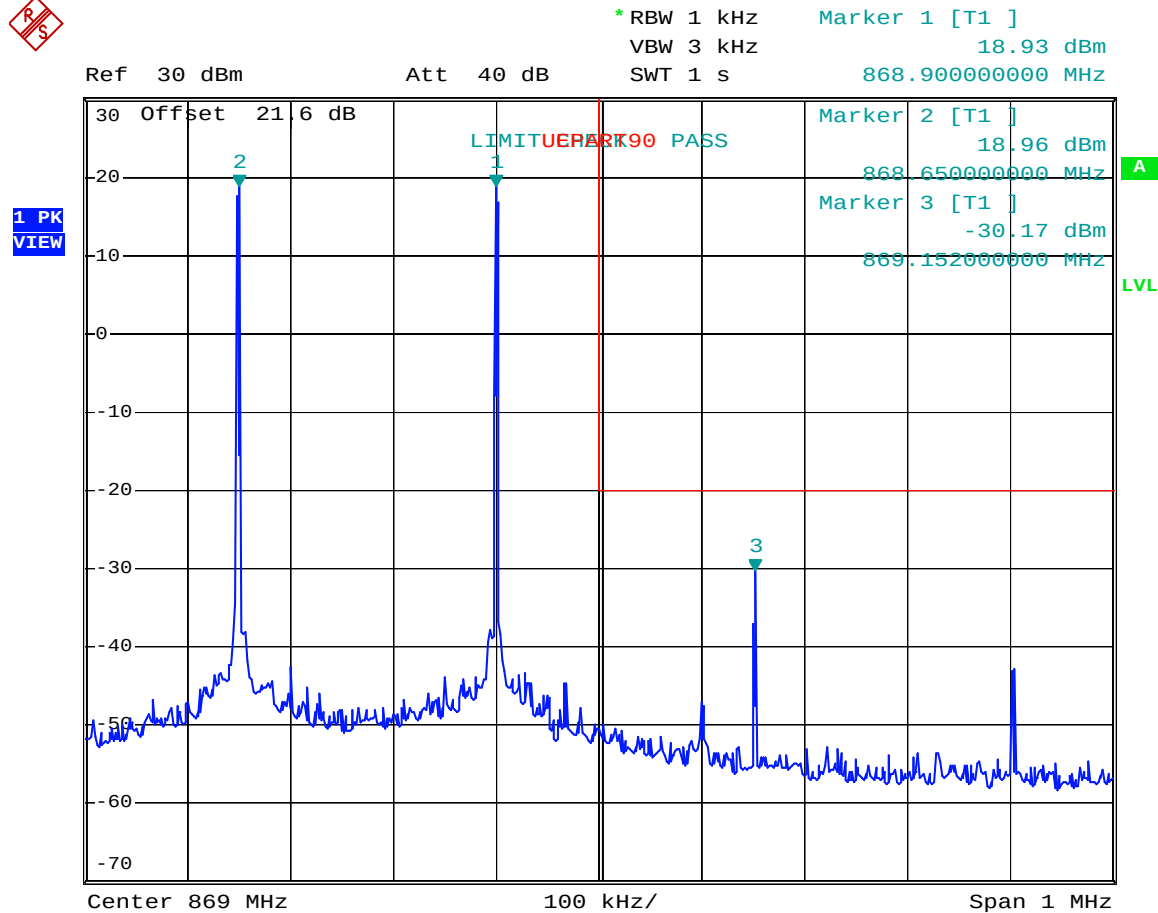
EQUIPMENT: MR8018

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation

Analog

Downlink



Date: 29.JAN.2009 10:05:08

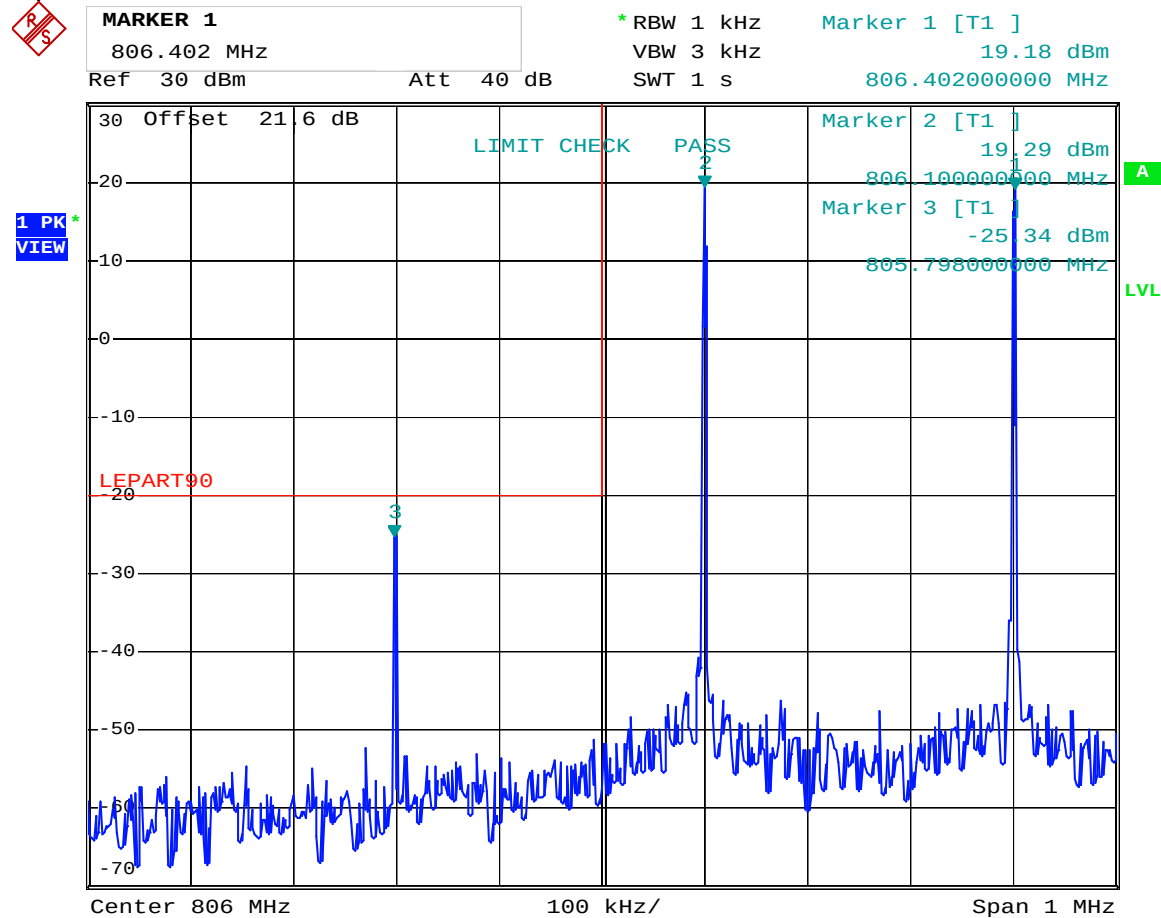
EQUIPMENT: MR8018

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

Analog

Uplink



Date: 29.JAN.2009 09:50:35

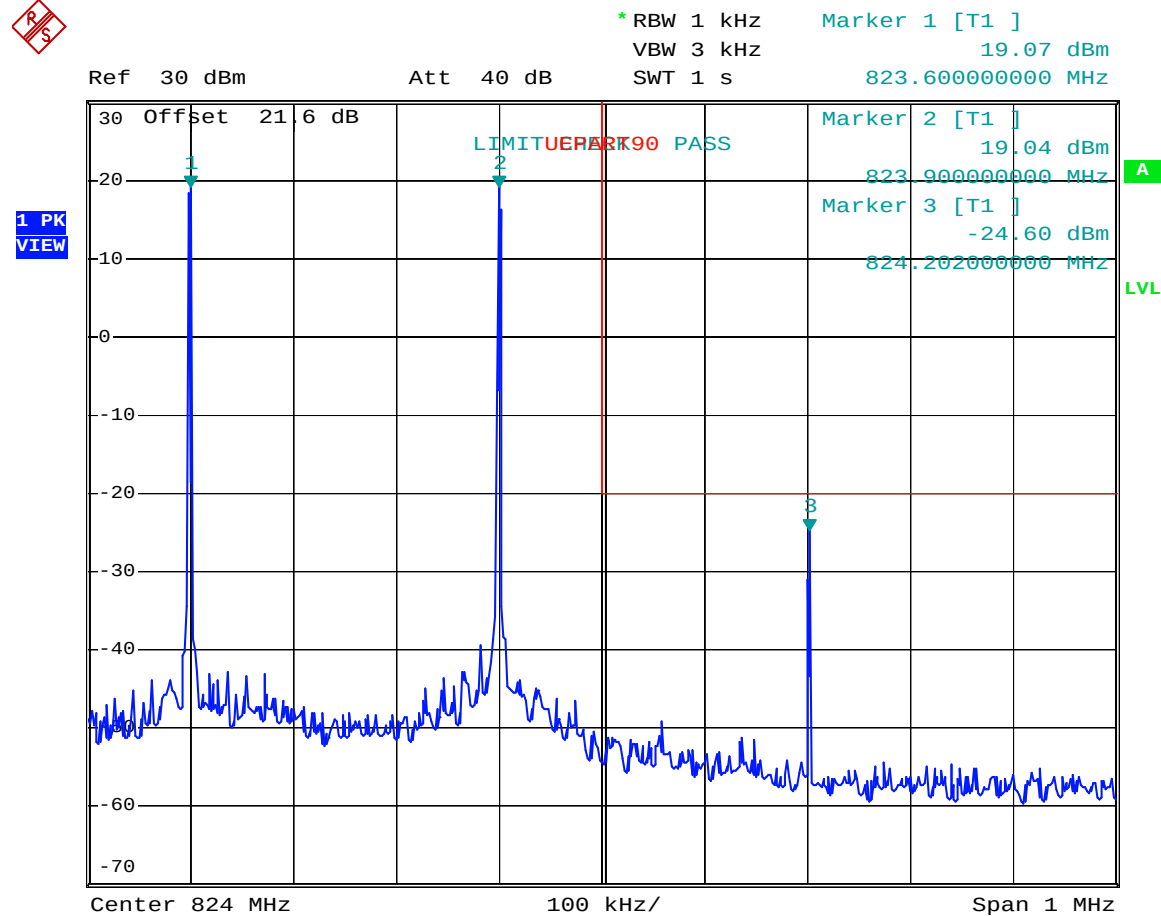
EQUIPMENT: MR8018

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation

Analog

Uplink

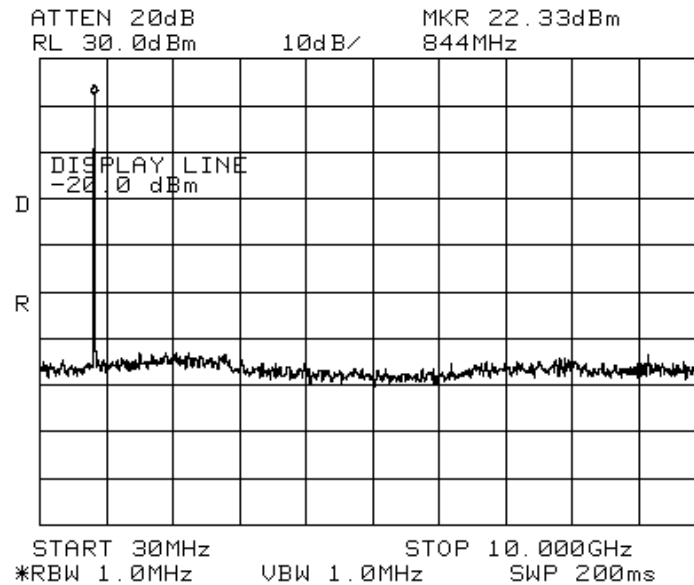


Date: 29.JAN.2009 09:53:14

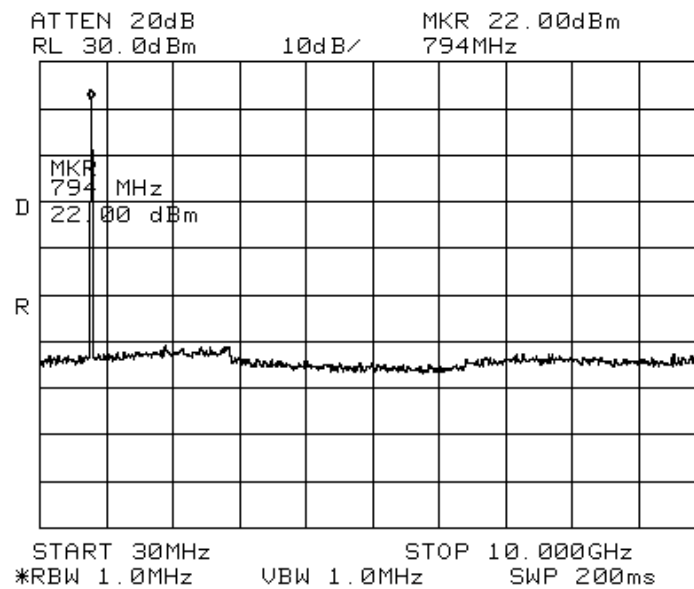
EQUIPMENT: MR8018

Test Data – Spurious Emissions at Antenna Terminals

Spurs
Downlink
Analog



Spurs
Uplink
Analog



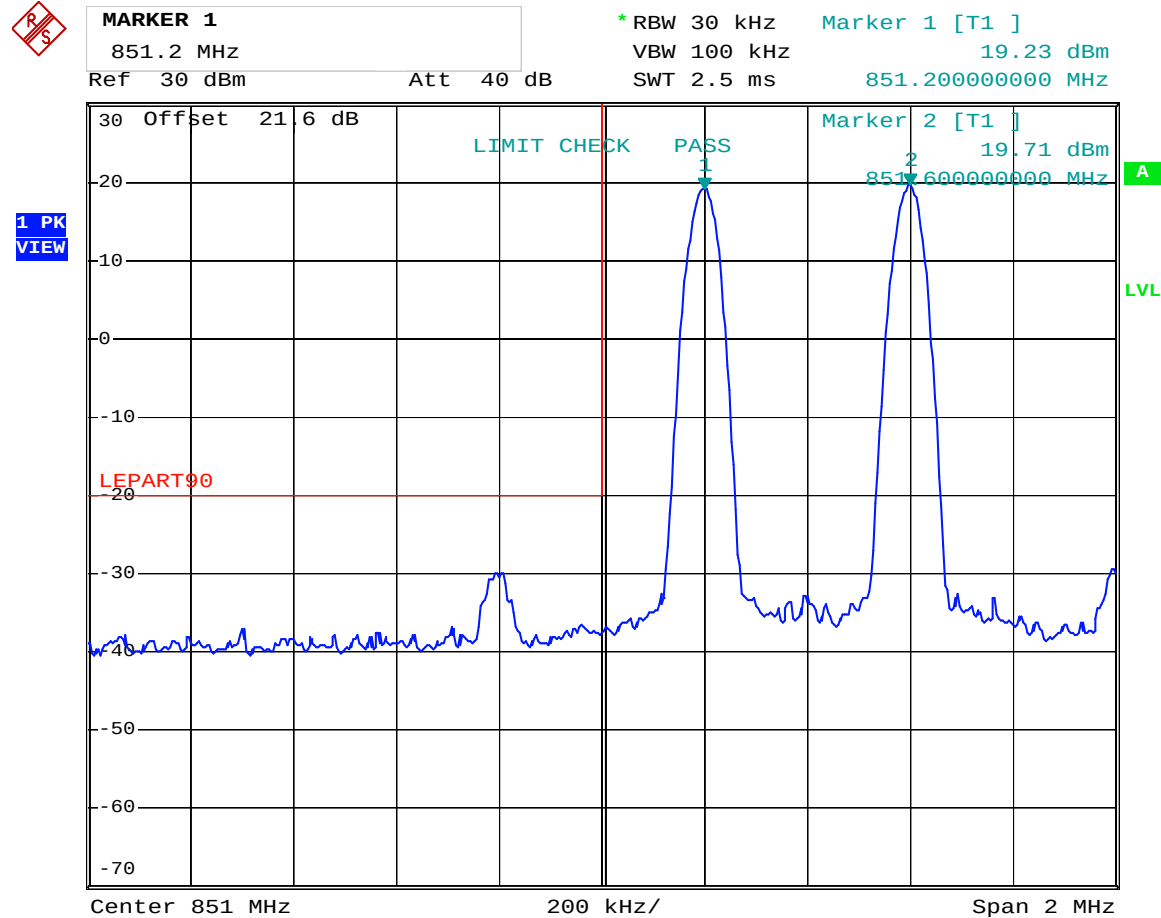
EQUIPMENT: MR8018

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

iDEN

Downlink



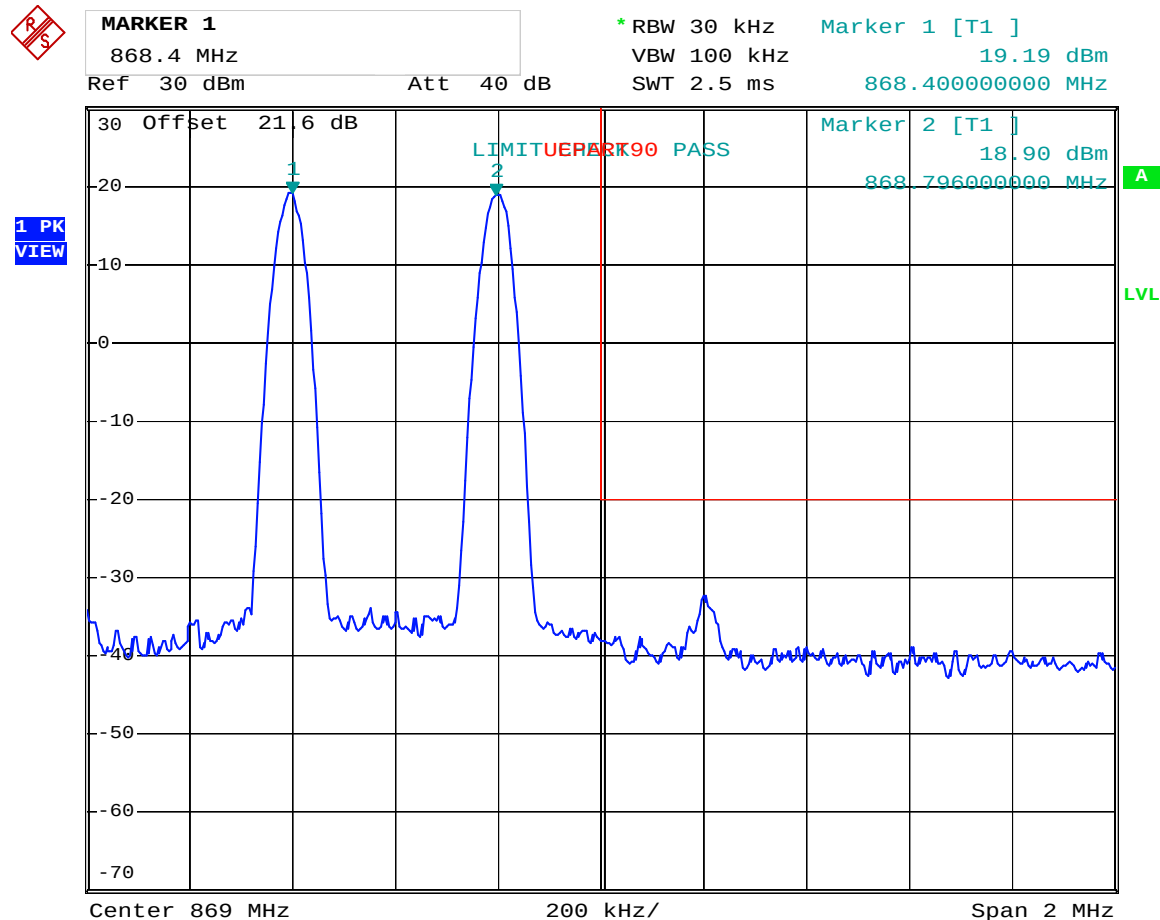
Date: 29.JAN.2009 09:18:14

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation

iDEN

Downlink



Date: 29.JAN.2009 09:21:22

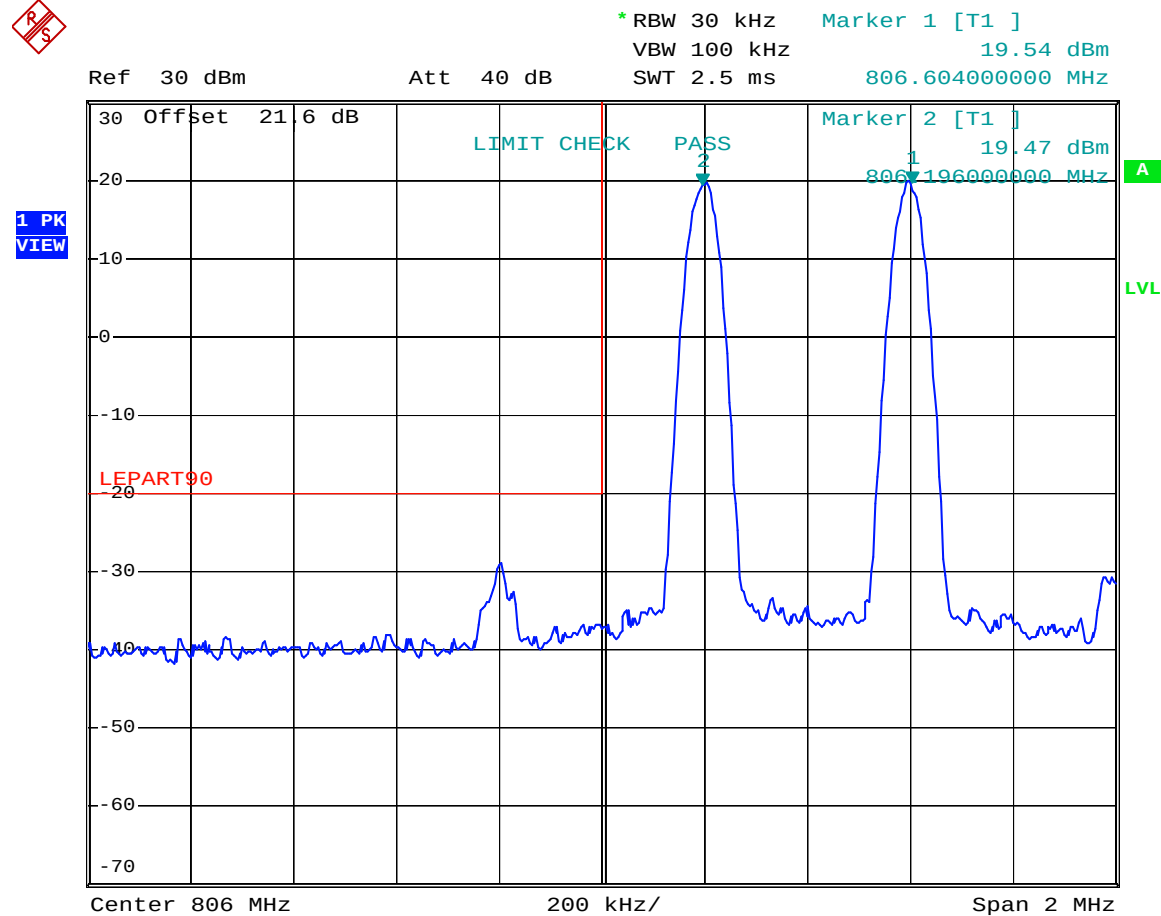
EQUIPMENT: MR8018

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

iDEN

Uplink



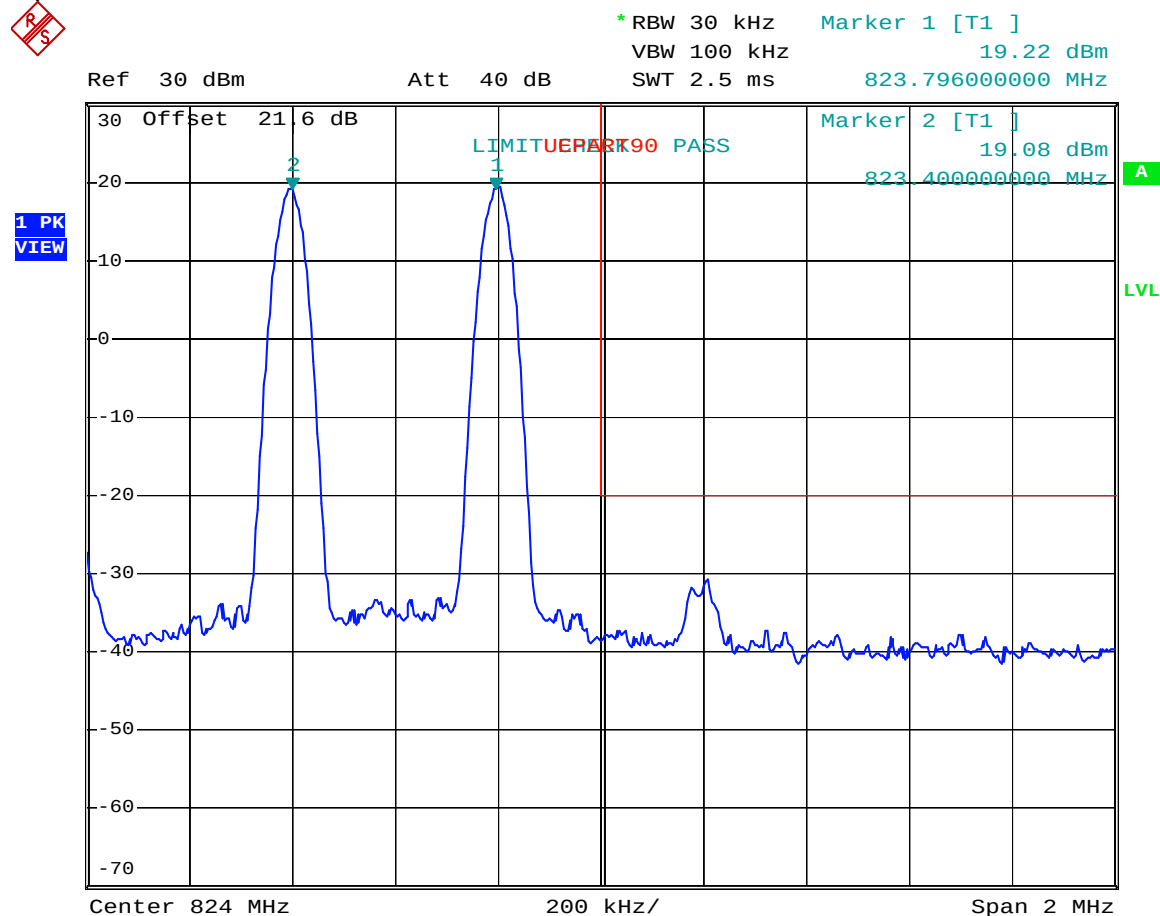
Date: 29.JAN.2009 09:33:04

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation

iDEN

Uplink

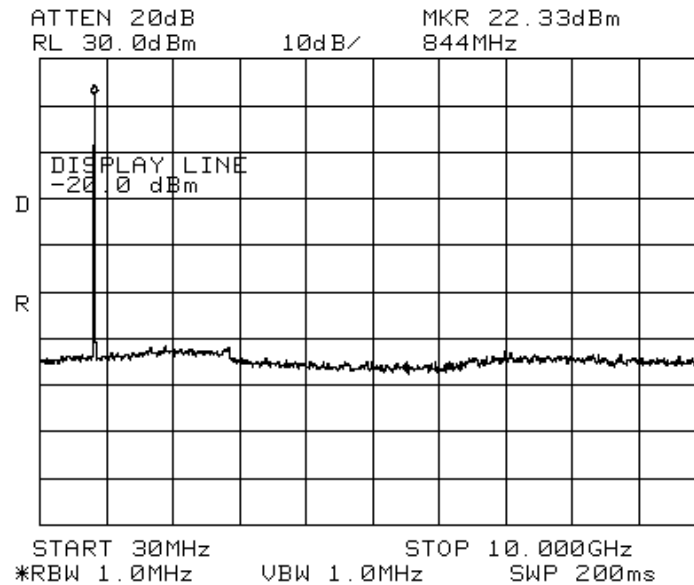


Date: 29.JAN.2009 09:35:01

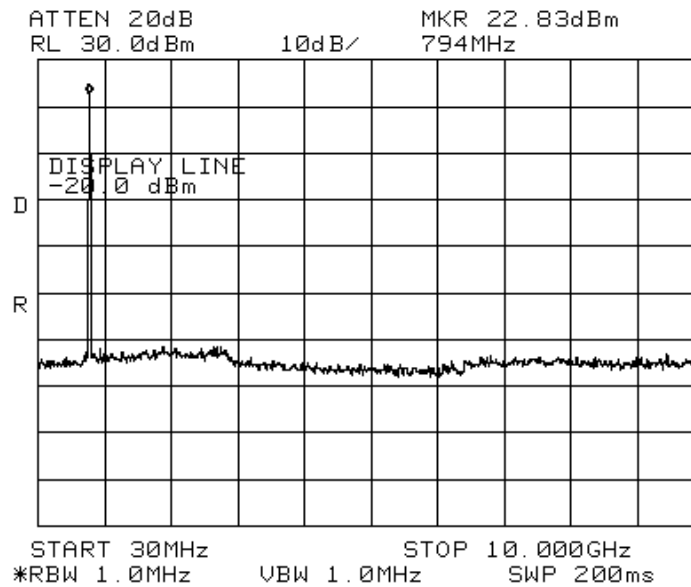
EQUIPMENT: MR8018

Test Data – Spurious Emissions at Antenna Terminals

Spurs
Downlink
IDEN



Spurs
Uplink
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: 29 January 2009

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 of -20 dBm.

Equipment Used: 1464-1484-1485-1016-993-791-1763

Measurement Uncertainty: +/-1.7 dB

Temperature: 22 °C

Relative Humidity: 35 %

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
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/30/07	01/30/09
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
1484	Cable	Storm PR90-010-072	N/A	05/07/08	05/07/09
1484	Cable	Storm PR90-010-072	N/A	05/07/08	05/07/09
993	Horn antenna	A.H. Systems SAS-200/571	XXX	08/31/07	08/30/08
1763	Bilog Antenna	Schaffner CBL 6111D	22926	11/04/08	11/04/09
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	05/07/08	05/07/09
791	PREAMP, 25dB	Nemko USA, Inc. LNA25	398	05/07/08	05/07/09

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.

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.

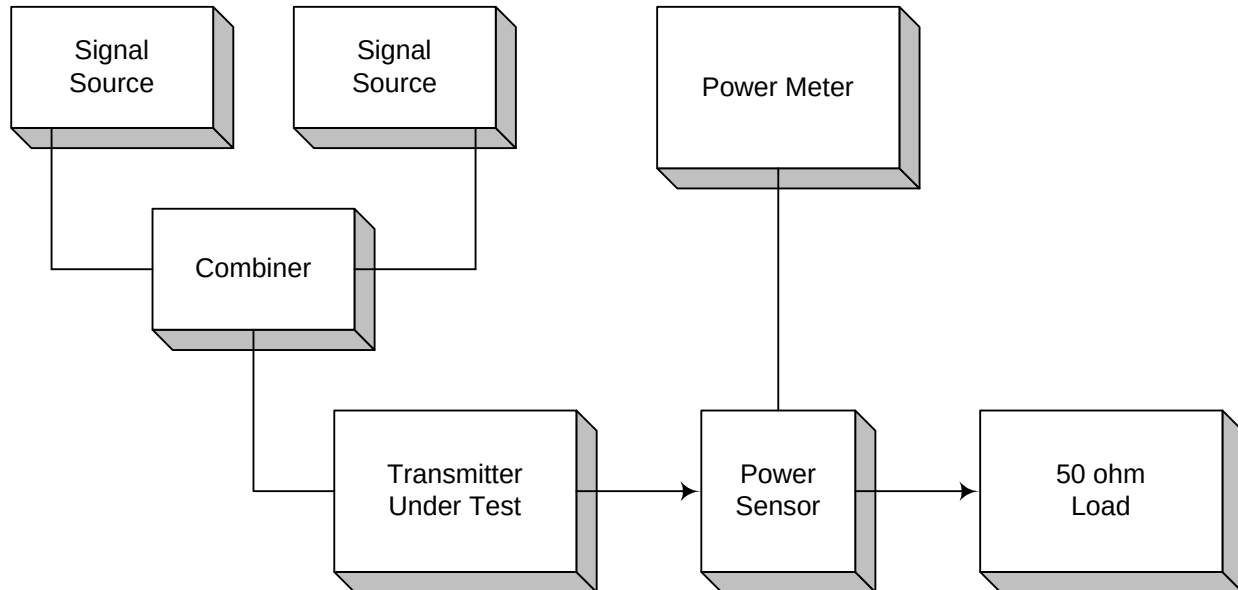
MASK	Spurious Limit	FS Limit Below 1 GHz	FS Limit Above 1 GHz
A,B,C,G,H,I	-13dBm	84.4 dB μ V/m@3m	82.2 dB μ V/m@3m
D,J	-20dBm	77.4 dB μ V/m@3m	75.2 dB μ V/m@3m
E,F,K	-25dBm	72.4 dB μ V/m@3m	70.2 dB μ V/m@3m

NAME OF TEST: Frequency Stability**PARA. NO.: 2.995****Minimum Standard:**
shall remainPara. No. 990.213. The transmitter carrier frequency
within the assigned frequency below in ppm.**Table 2**

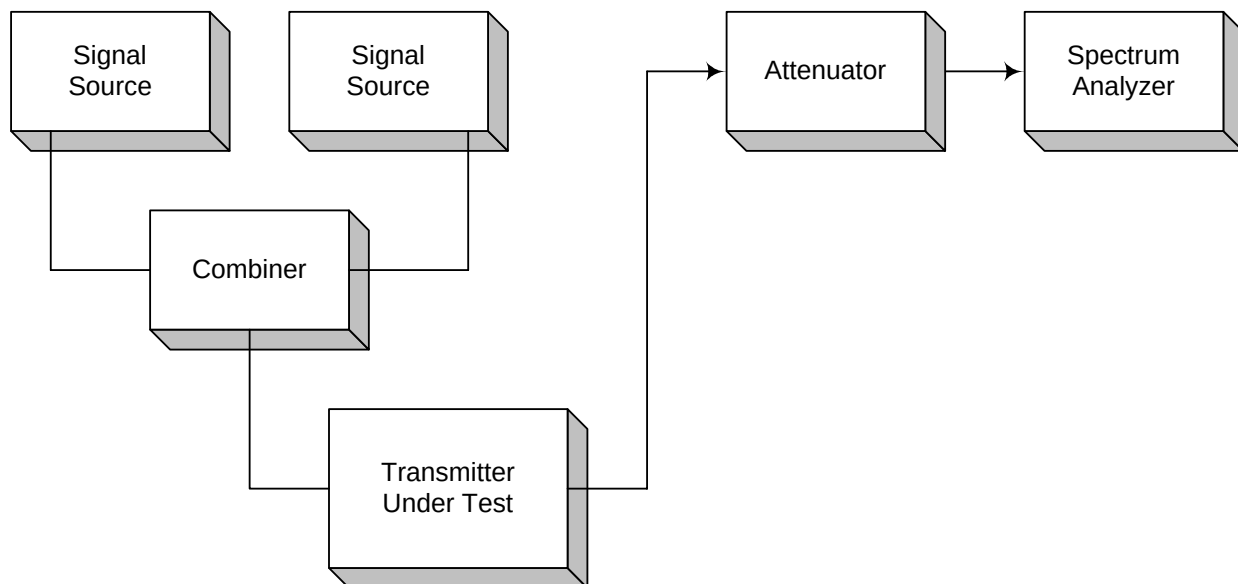
Frequency Band (MHz)	Fixed And Base Stations	Mobile Stations	
		> 2 Watts o/p pwr	< 2 Watts o/p pwr
Below 25	100	100	200
25 - 50	20	20	50
72 - 76	5	-	50
150 - 174	5	5	5
220 - 222	0.1	1.5	1.5
421 - 512	2.5	5	5
806 - 821	1.5	2.5	2.5
821 - 824	1.0	1.5	15
851 - 866	1.5	2.5	2.5
866 - 869	1.0	1.5	1.5
869 - 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

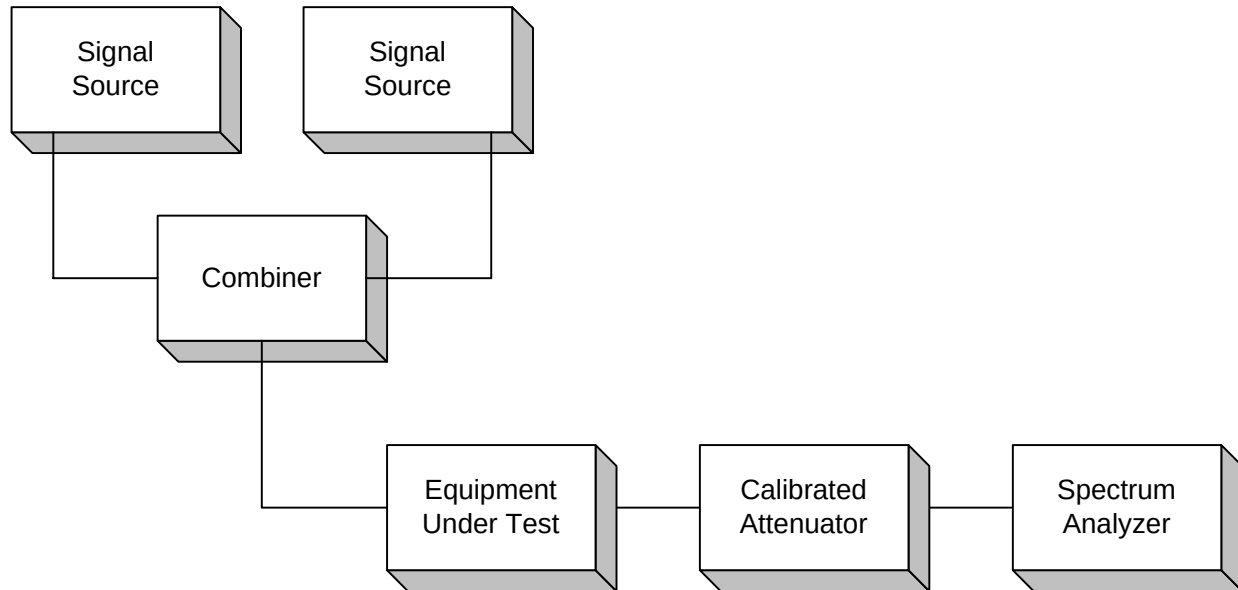
Para. No. 2.985 - R.F. Power Output



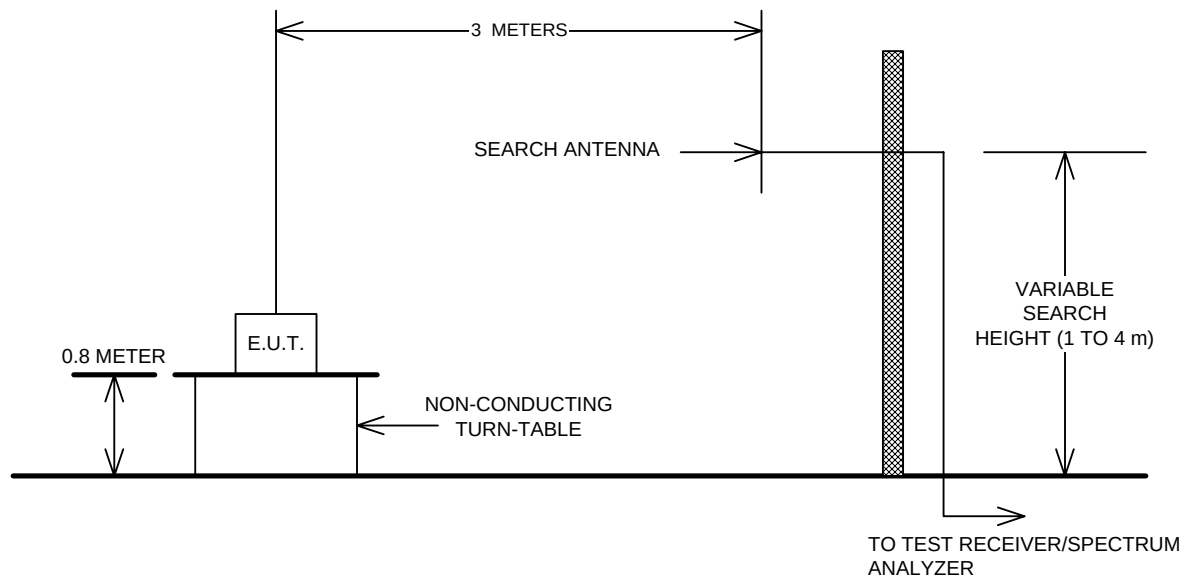
Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 - Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability

