



Nemko Test Report: 16263RUS1

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

**Equipment Under Test:
(E.U.T.)** AF8037

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

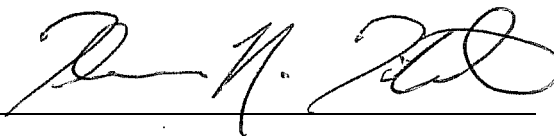
TESTED BY:



David Light, Senior Wireless Engineer

DATE: 07 October, 2008

APPROVED BY:



DATE: 08 October, 2008

Number of Pages: 41

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EQUIPMENT: AF8037

PROJECT NO.: 16263RUS1

Section 1. Summary of Test Results

Manufacturer Andrew Corporation

Model No.: AF8037

Serial No.: 16

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	Table	Complies
Occupied Bandwidth	90.210	Input/Output	Complies
Spurious Emissions at Antenna Terminals	90.210	-13 dBm	Complies
Field Strength of Spurious Emissions	90.210	-13 dBm	Complies
Frequency Stability	90.213		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.
- (3) The E.U.T. uses a common oscillator to down-convert the rf input frequency to an intermediate frequency and to up-convert the IF signal back to the rf output frequency. The rf input and output frequencies are the same.

Section 2. General Equipment Specification**Transmitter****Supply Voltage Input:** 120 Vac**Frequency Range:** 851 to 869 MHz Downlink

806 to 824 MHz Uplink

Type(s) of Modulation:	F3E / F1D (Analog)	D7W (QAM)	Other
	☒	☒	☐

Gain: 94 dB**Output Impedance:** 50 ohms

RF Power Output (rated):	Downlink	$\frac{5.0}{37}$	W dBm
	Uplink:	$\frac{1.0}{0.5}$	W dBm

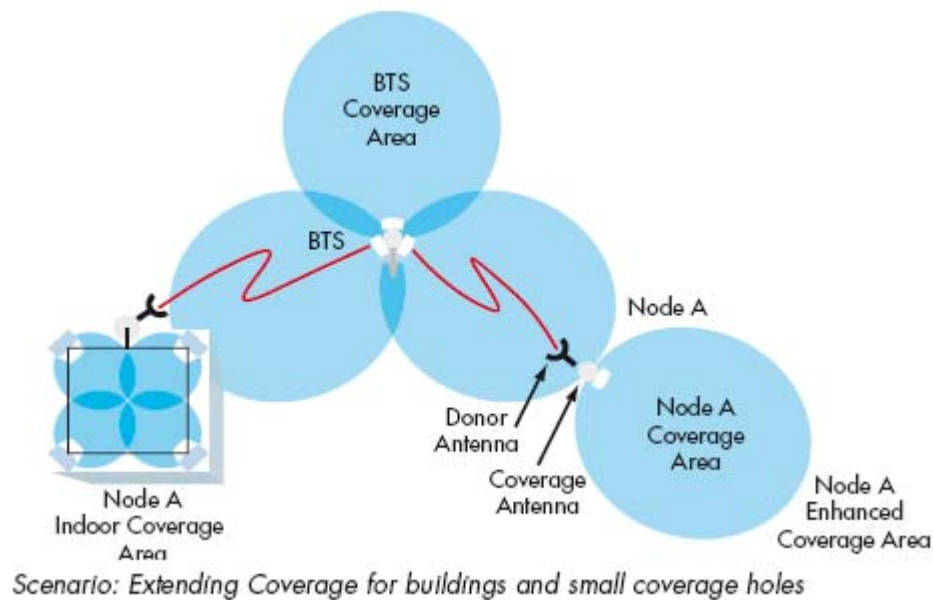
Frequency Translation:	F1-F1	F1-F2	N/A
	☒	☐	☐

Band Selection:	Software	Duplexer Change	Fullband Coverage
	☒	☐	☐

Description of EUT

The Node A is an RF enhancer which is capable of filtering and amplifying a multitude of distinct sub-bands up to 120 MHz in total anywhere within multiple frequency bands. It is designed to be part of the primary infrastructure

System Diagram



Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.985
TESTED BY: David Light	DATE: 07 October 2008

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

Direction	Modulation	Composite Power (dBm)	RF Power (W)
Downlink	iDEN	37	5.0
	Analog	37	5.0
Uplink	iDEN	30	1.0
	Analog	30	1.0

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

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.989
TESTED BY: David Light	DATE: 07 October 2008

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1065-1604-1082-1659

Measurement Uncertainty: 1X10⁻⁷ Ppm

Temperature: 22 °C

Relative Humidity: 48 %

EQUIPMENT: AF8037

PROJECT NO.: 16263RUS1

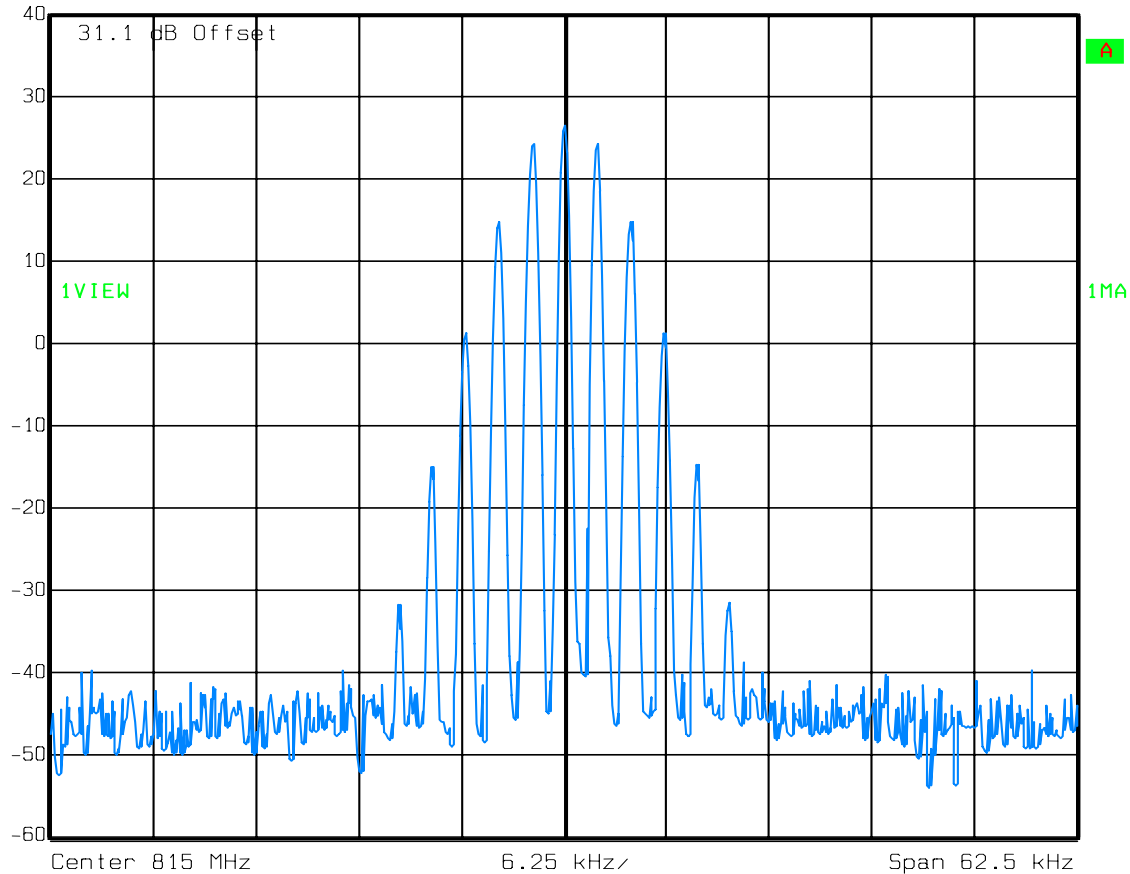
Test Data – Occupied Bandwidth

Analog - Output

Uplink

Ref Lvl
40 dBm

RBW	300 Hz	RF Att	20 dB
VBW	300 Hz	Mixer	-10 dBm
SWT	3.5 s	Unit	dBm



Date: 07.OCT.2008 09:02:40

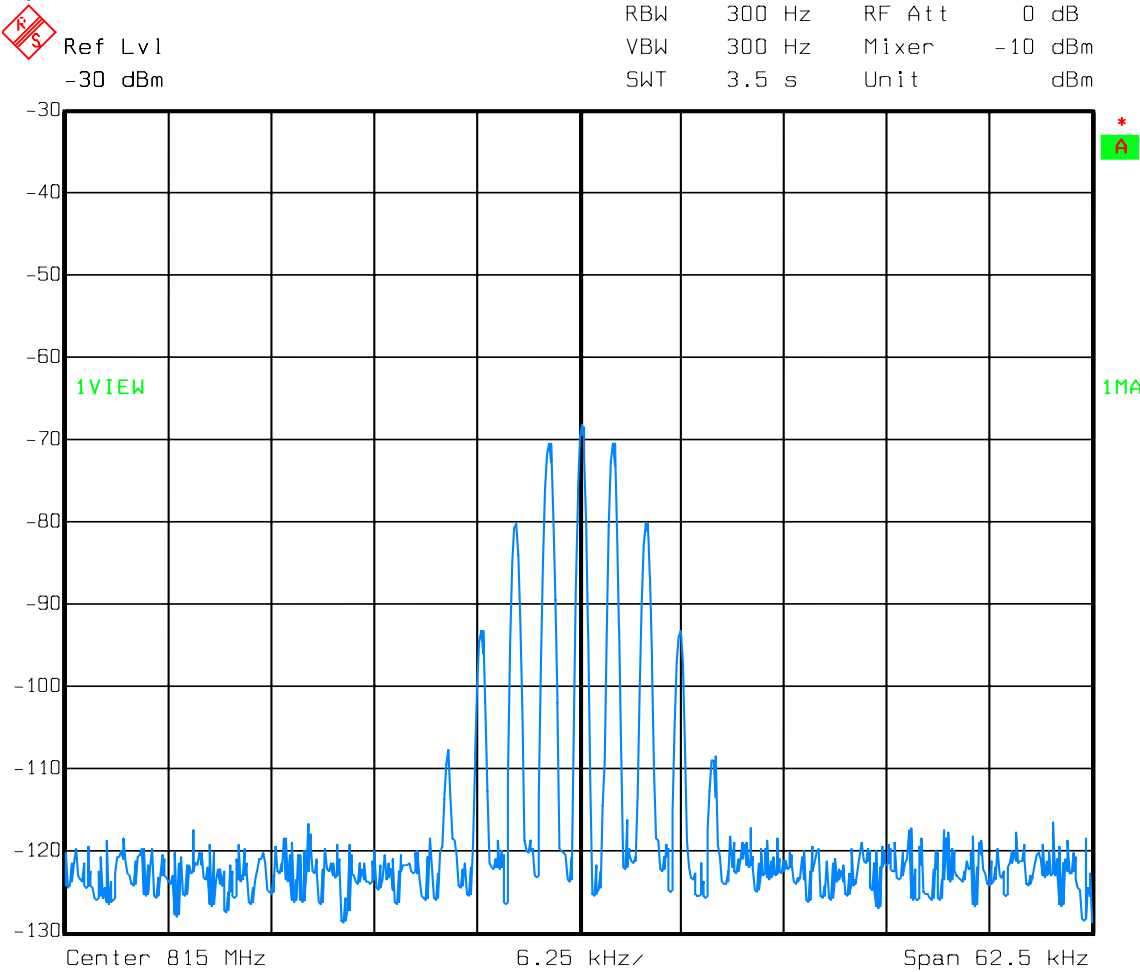
2 kHz tone @ 2.5 kHz peak deviation

EQUIPMENT: AF8037

PROJECT NO.: 16263RUS1

Test Data – Occupied Bandwidth

Analog – Input
Uplink



Date: 07.OCT.2008 09:03:44

EQUIPMENT: AF8037

PROJECT NO.: 16263RUS1

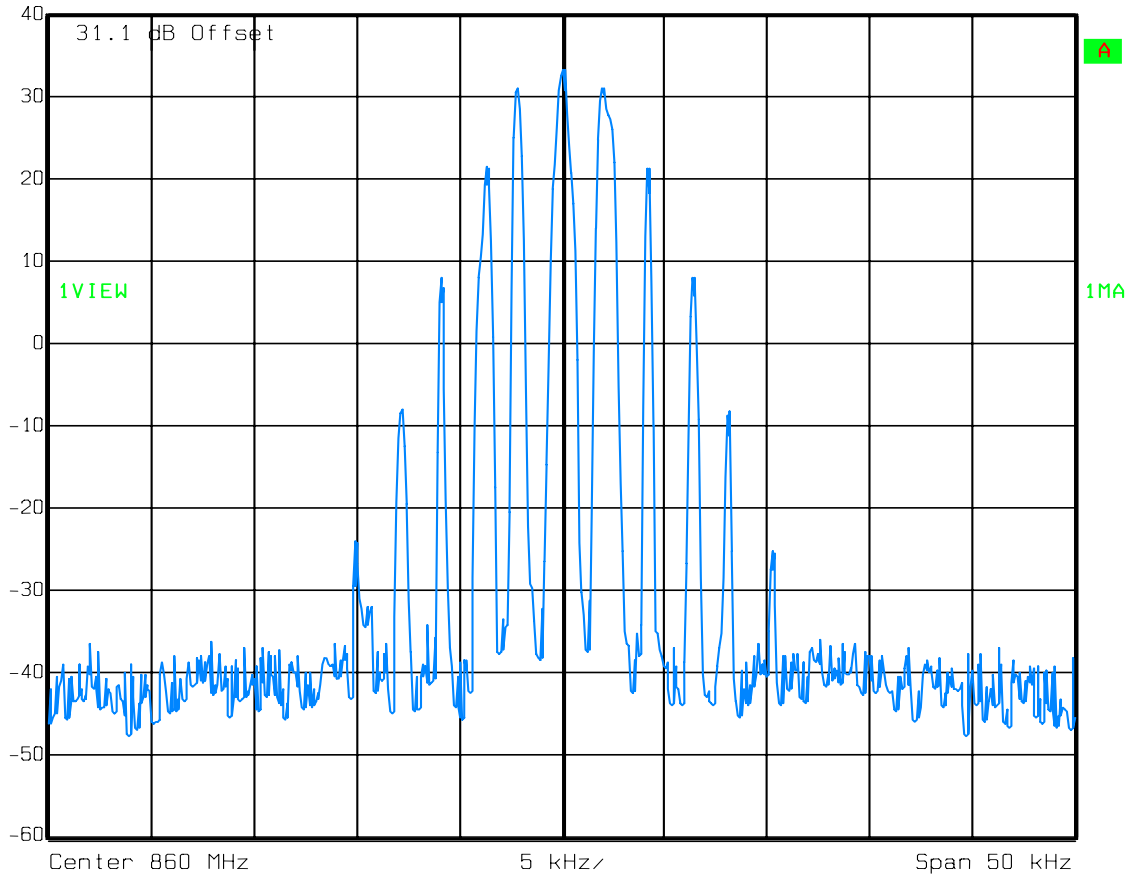
Test Data – Occupied Bandwidth

Analog - Output

Downlink

Ref Lvl
40 dBm

RBW	300 Hz	RF Att	20 dB
VBW	300 Hz	Mixer	-10 dBm
SWT	2.8 s	Unit	dBm



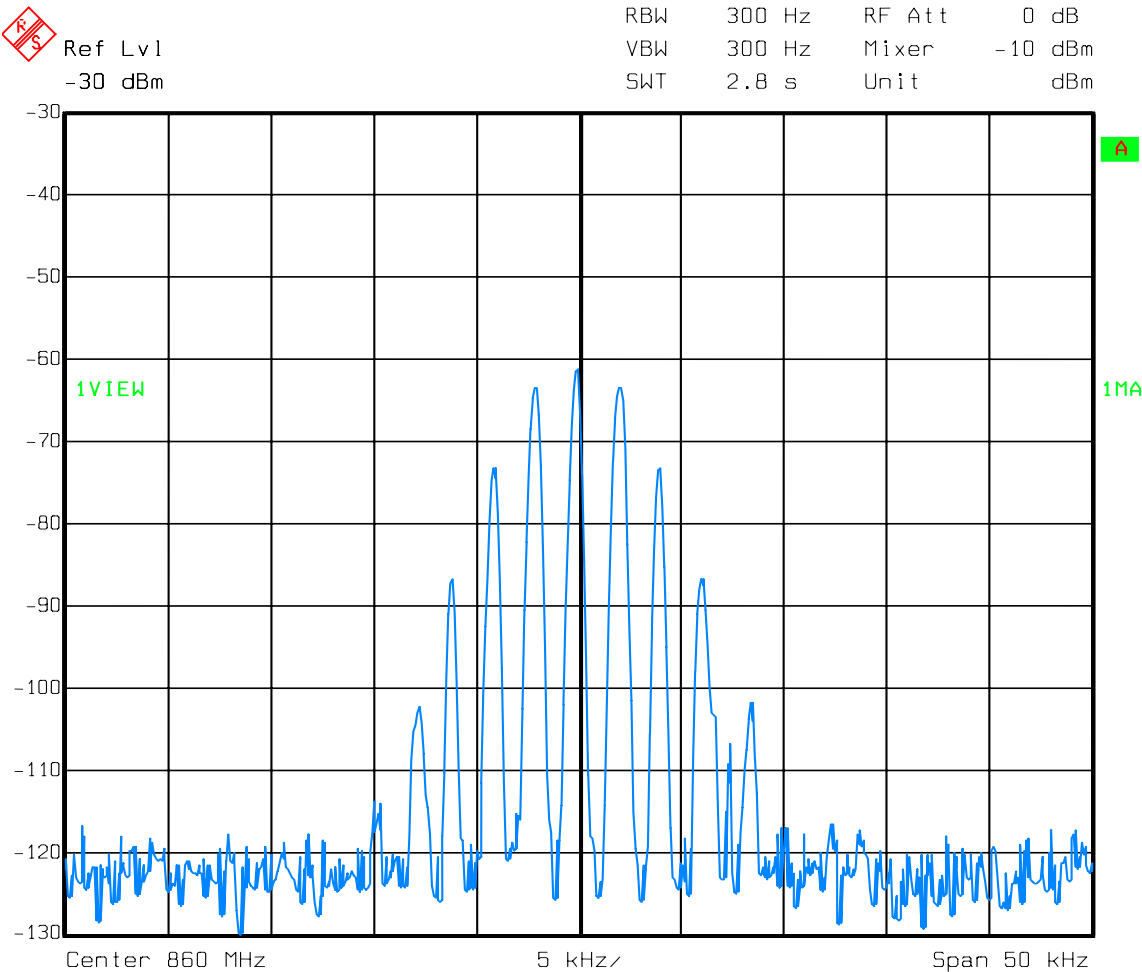
Date: 07.OCT.2008 09:21:42
2 kHz tone @ 2.5 kHz peak deviation

EQUIPMENT: AF8037

PROJECT NO.: 16263RUS1

Test Data – Occupied Bandwidth

Analog – Input
Downlink



Date: 07.OCT.2008 09:23:27

EQUIPMENT: AF8037

PROJECT NO.: 16263RUS1

Test Data – Occupied Bandwidth

iDEN – Output

Uplink



Ref Lvl

40 dBm

RBW 1 kHz

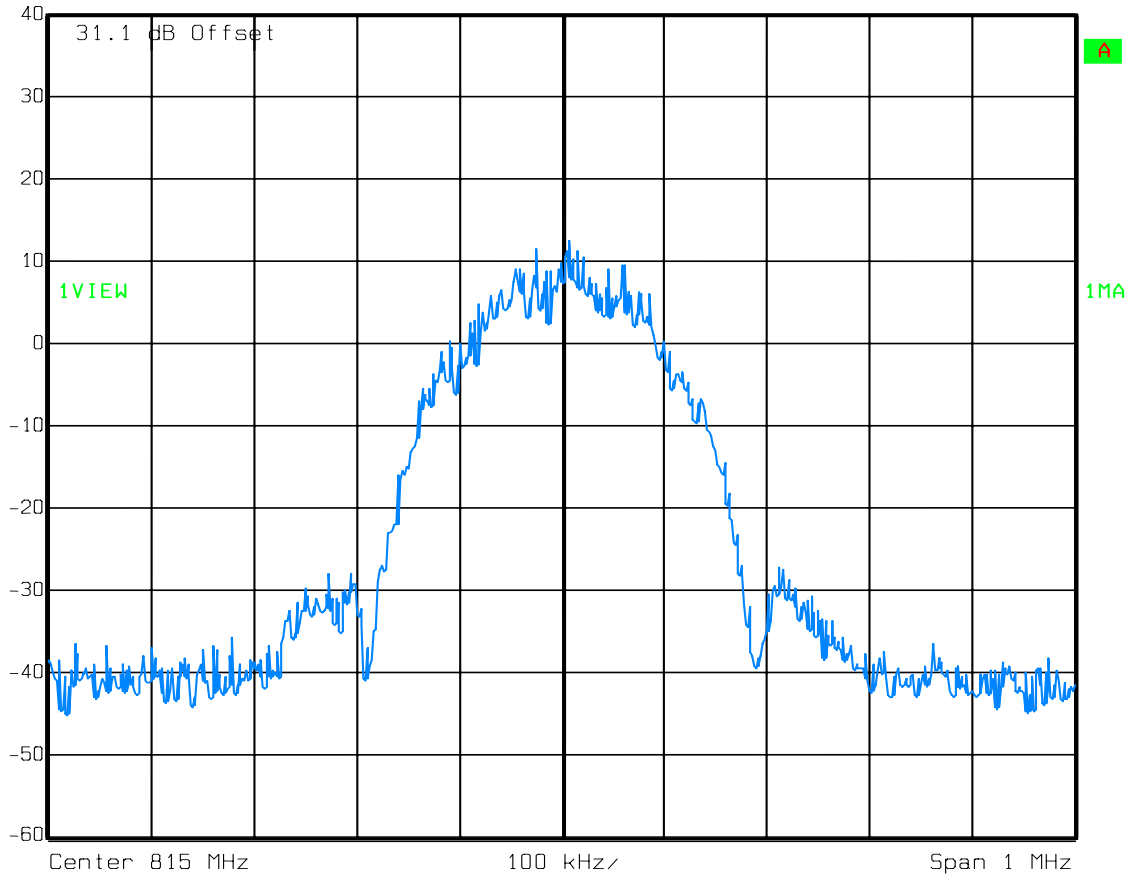
RF Att 20 dB

VBW 1 kHz

Mixer -10 dBm

SWT 2.5 s

Unit dBm



Date: 07.OCT.2008 08:58:26

Test Data – Occupied Bandwidth

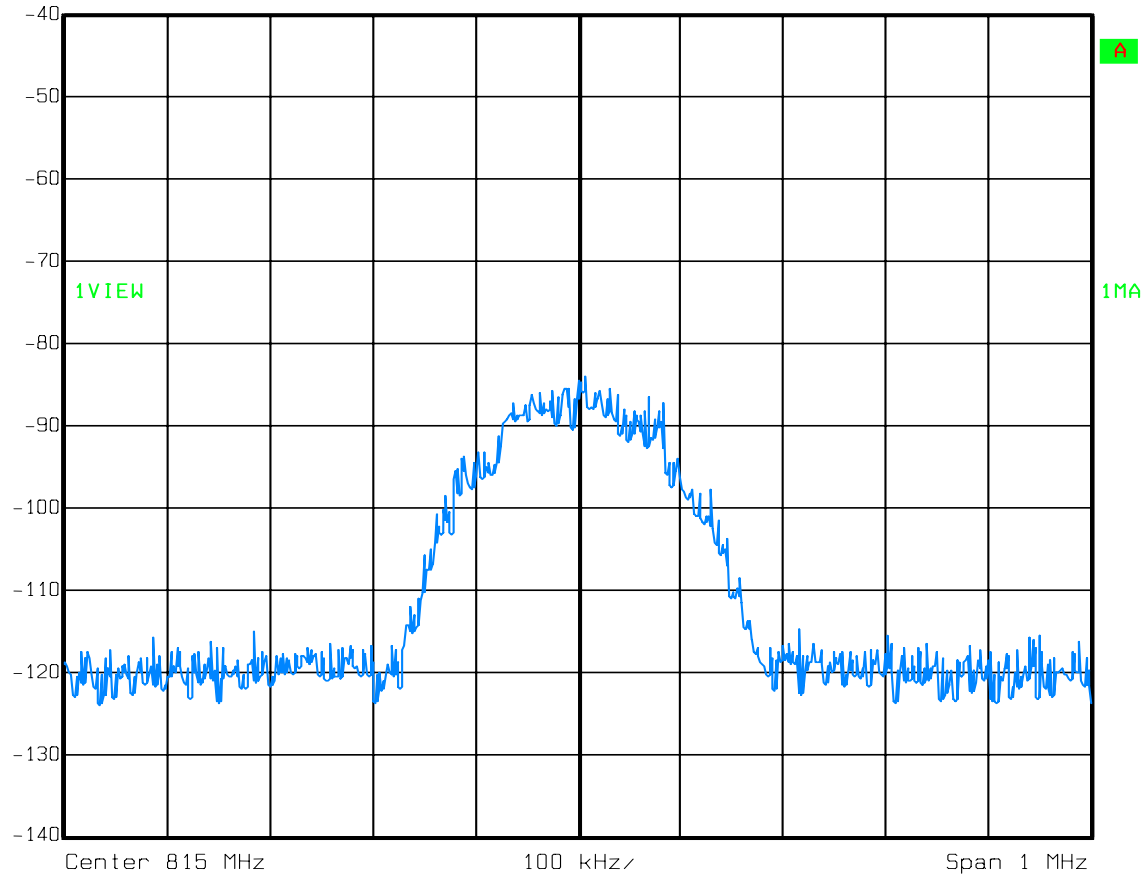
iDEN - Input

Uplink



Ref Lvl
-40 dBm

RBW	1 kHz	RF Att	0 dB
VBW	1 kHz	Mixer	-10 dBm
SWT	2.5 s	Unit	dBm



Date: 07.OCT.2008 08:59:52

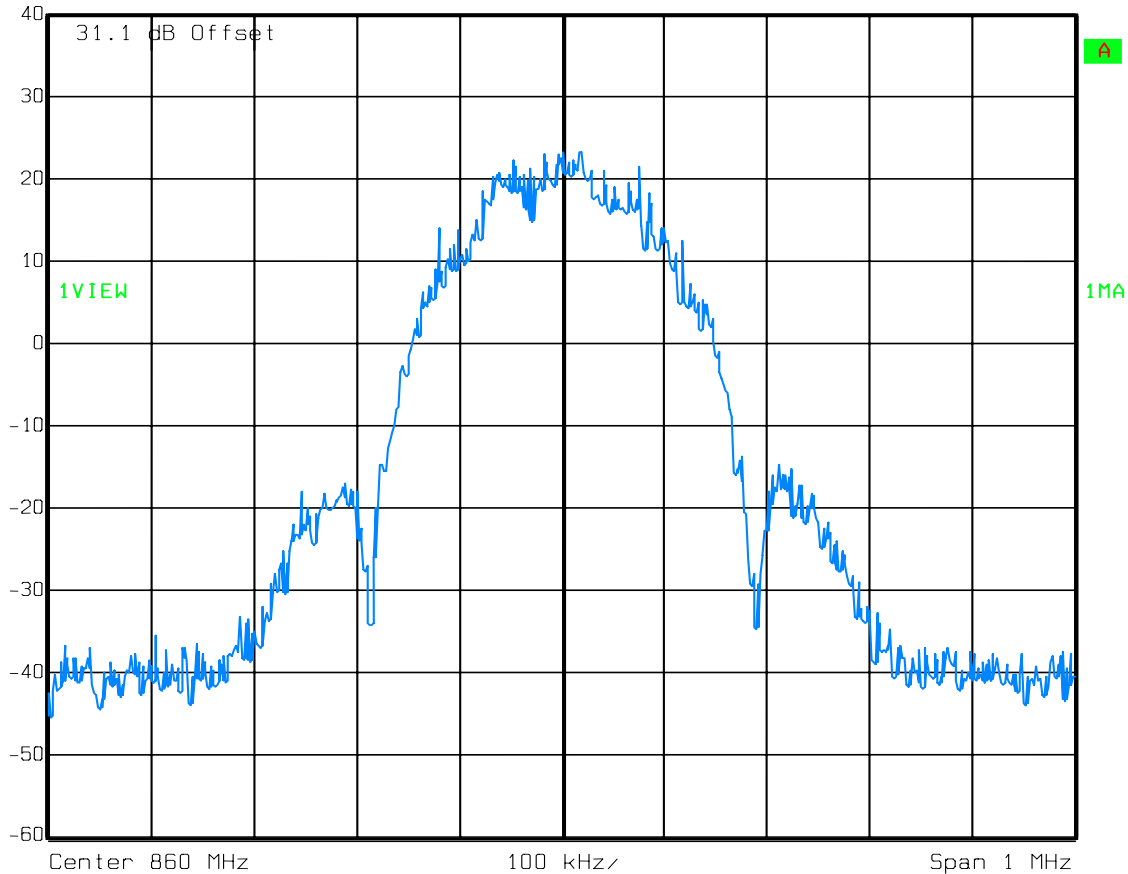
Test Data – Occupied Bandwidth

iDEN – Output
Downlink



Ref Lvl
40 dBm

RBW	1 kHz	RF Att	30 dB
VBW	1 kHz		
SWT	2.5 s	Unit	dBm



Date: 07.OCT.2008 10:19:10

Test Data – Occupied Bandwidth

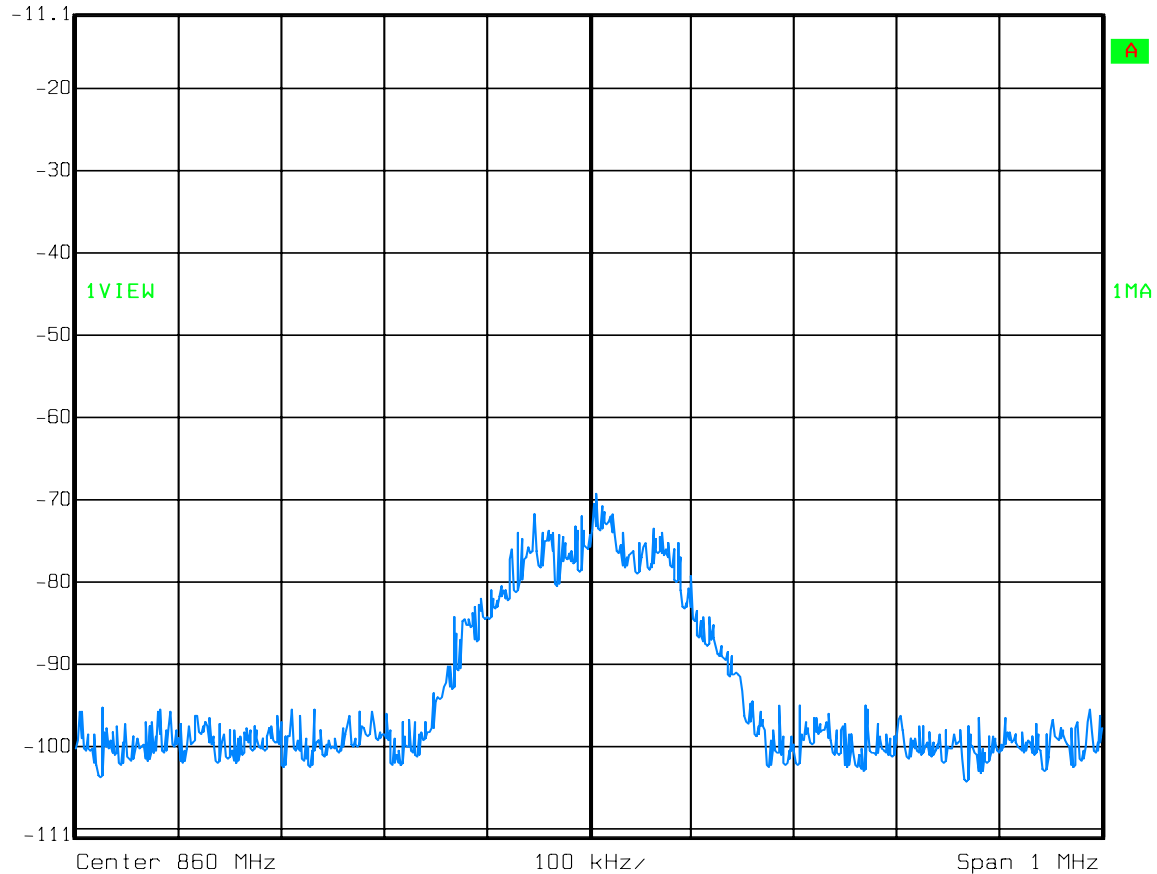
iDEN - Input

Downlink



Ref Lvl
-11.1 dBm

RBW	1 kHz	RF Att	20 dB
VBW	1 kHz		
SWT	2.5 s	Unit	dBm



Date: 07.OCT.2008 10:20:09

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.991
TESTED BY: David Light	DATE: 07 October 2008

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1065-1604-1082-1659

Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 48 %

Test Data – Spurious Emissions at Antenna Terminals

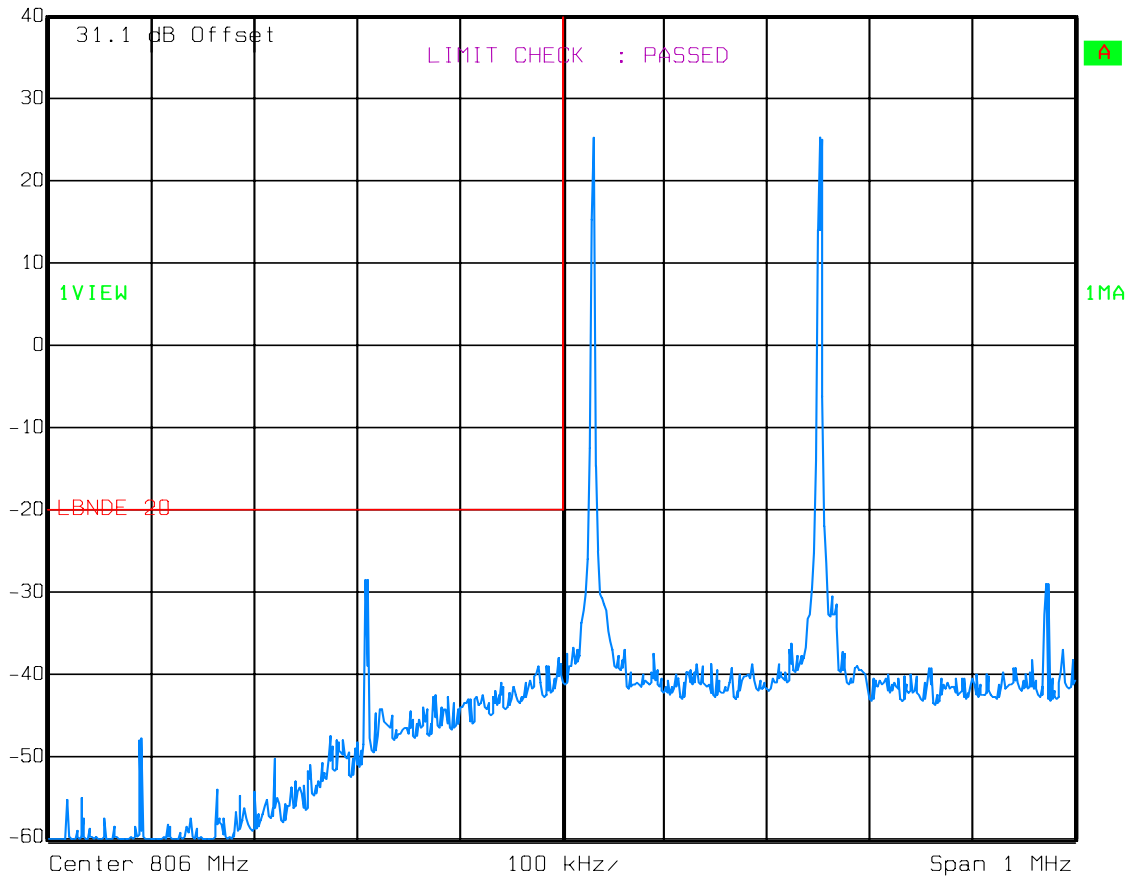
Lower Bandedge Intermodulation

Analog

Uplink

Ref Lvl
40 dBm

RBW	1 kHz	RF Att	20 dB
VBW	1 kHz	Mixer	-10 dBm
SWT	2.5 s	Unit	dBm



Date: 07.OCT.2008 09:10:45

Test Data – Spurious Emissions at Antenna Terminals

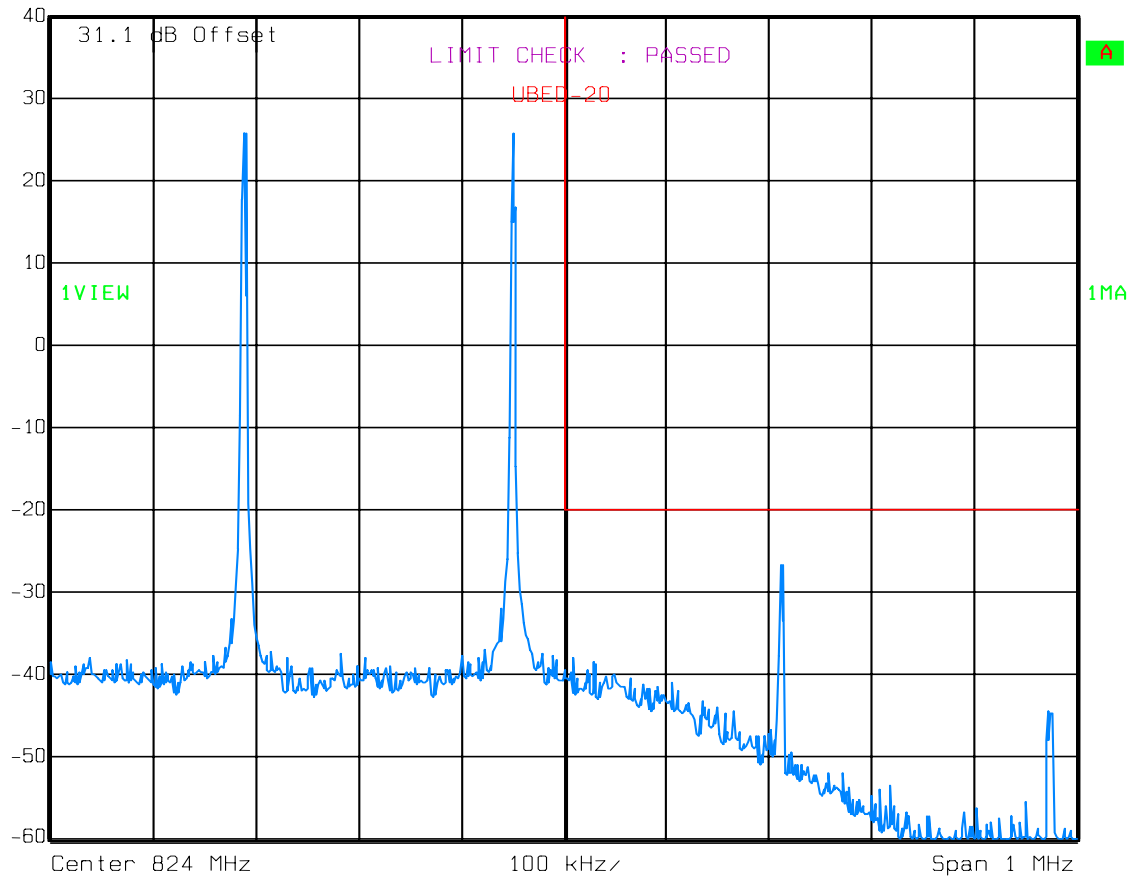
Upper Bandedge Intermodulation

Analog

Uplink

Ref Lvl
40 dBm

RBW	1 kHz	RF Att	20 dB
VBW	1 kHz	Mixer	-10 dBm
SWT	2.5 s	Unit	dBm



Date: 07.OCT.2008 09:08:17

Spurs – Analog - Uplink



Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

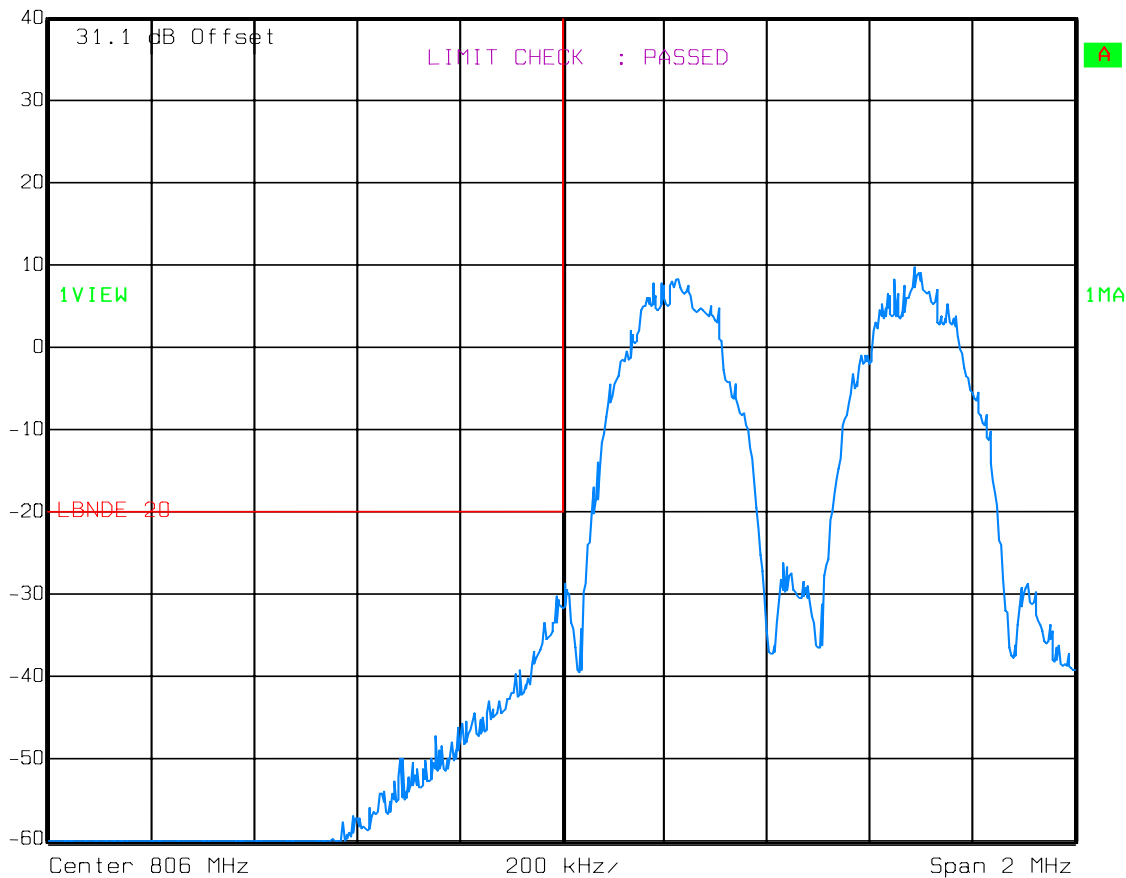
iDEN

Uplink



Ref Lvl
40 dBm

RBW	1 kHz	RF Att	20 dB
VBW	1 kHz	Mixer	-10 dBm
SWT	5 s	Unit	dBm



Date: 07.OCT.2008 08:51:52

Test Data – Spurious Emissions at Antenna Terminals

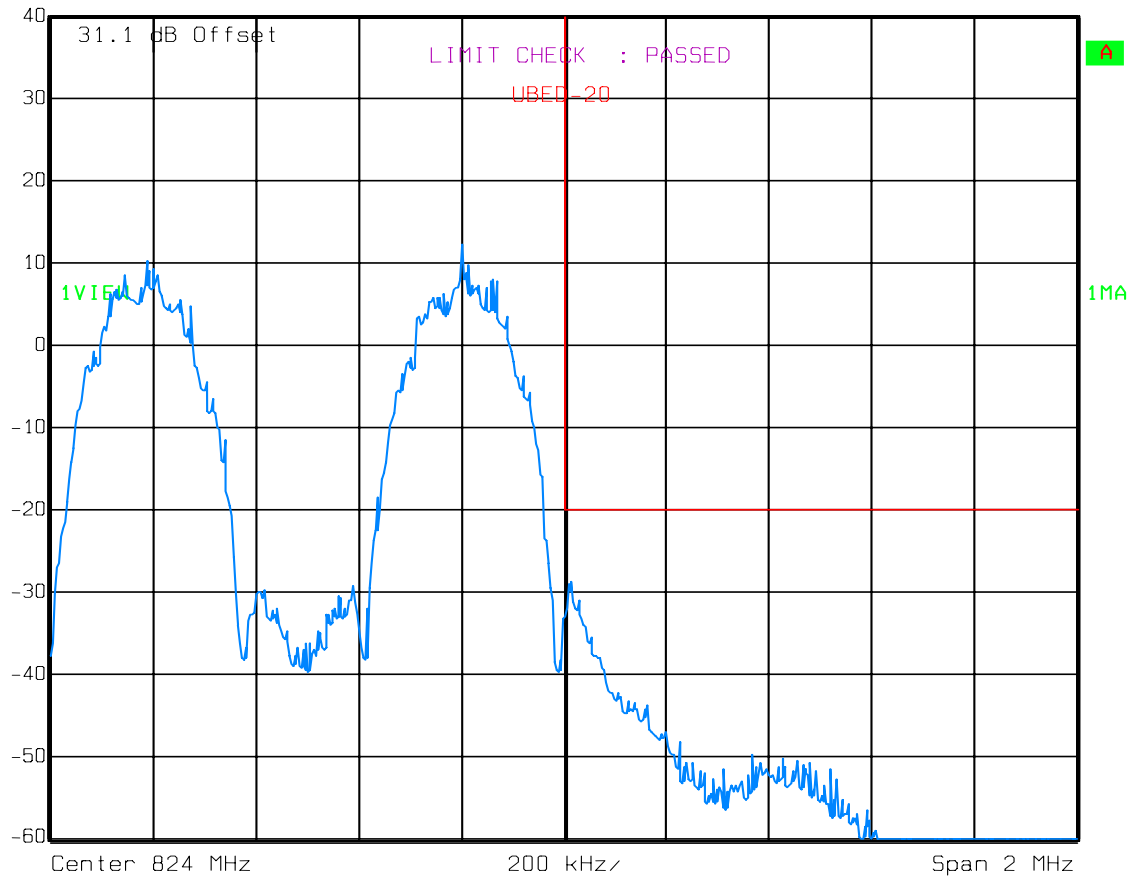
Upper Bandedge Intermodulation

iDEN

Uplink

Ref Lvl
40 dBm

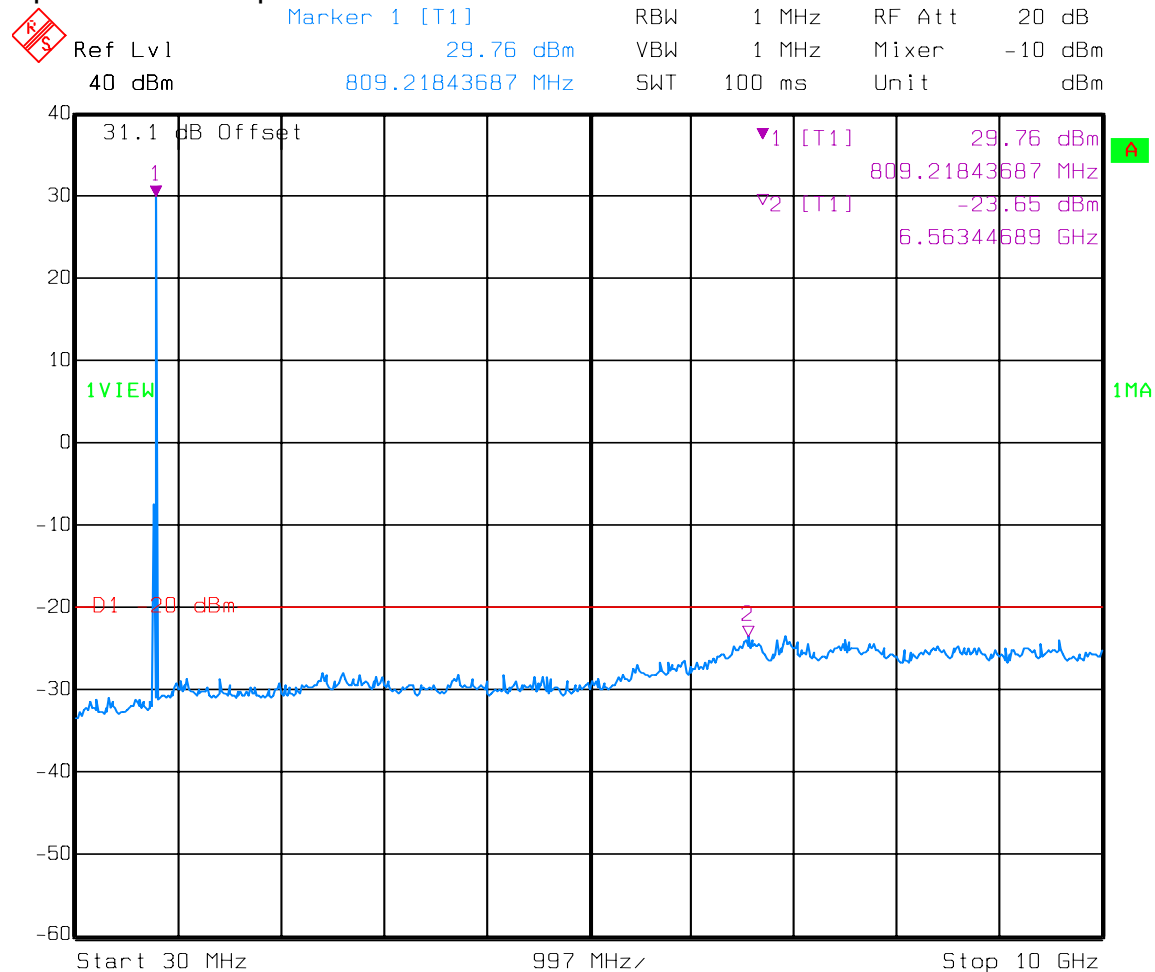
RBW	1 kHz	RF Att	20 dB
VBW	1 kHz	Mixer	-10 dBm
SWT	5 s	Unit	dBm



Date: 07.OCT.2008 08:53:33

Test Data – Spurious Emissions at Antenna Terminals

Spurs – iDEN - Uplink



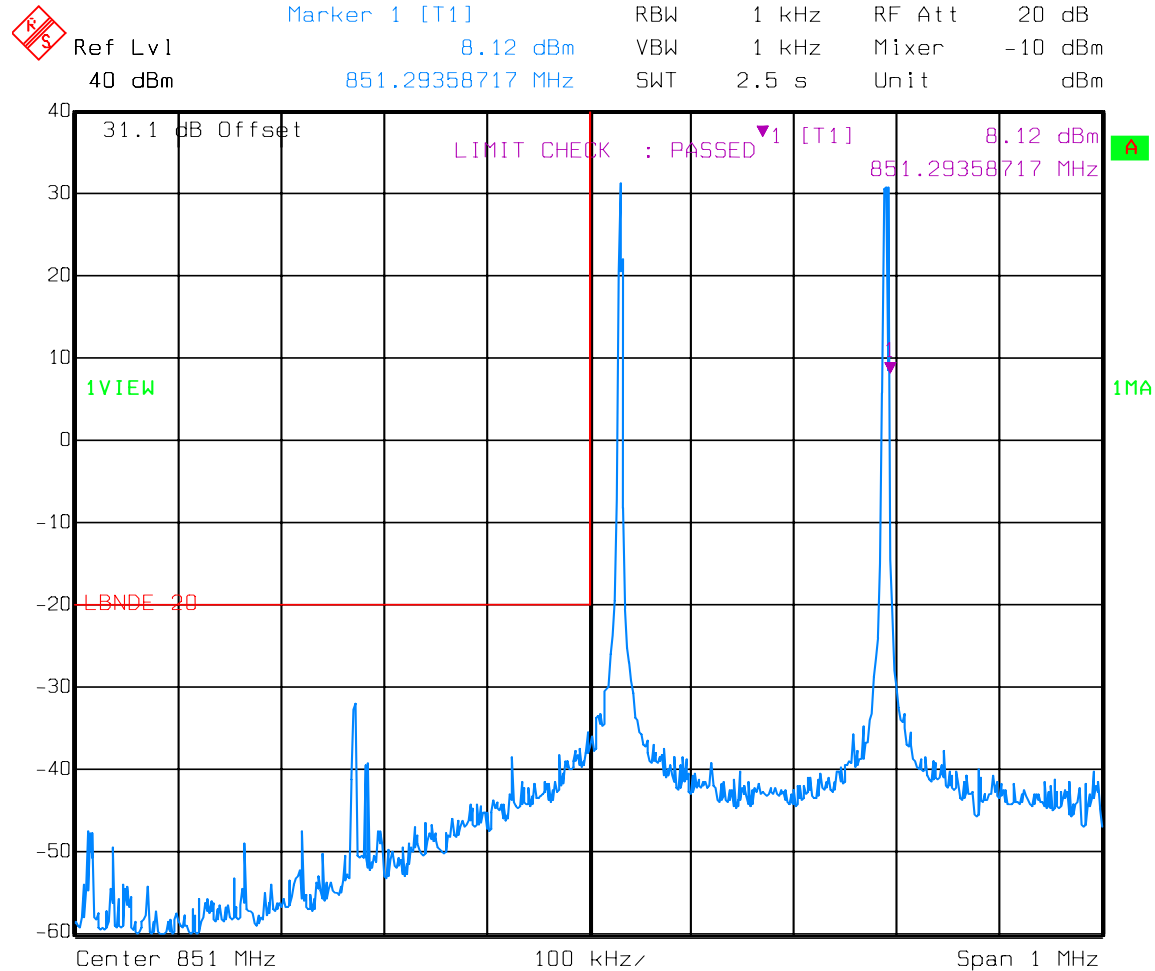
Date: 07.OCT.2008 08:56:43

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

Analog

Downlink



Date: 07.OCT.2008 09:13:23

Test Data – Spurious Emissions at Antenna Terminals

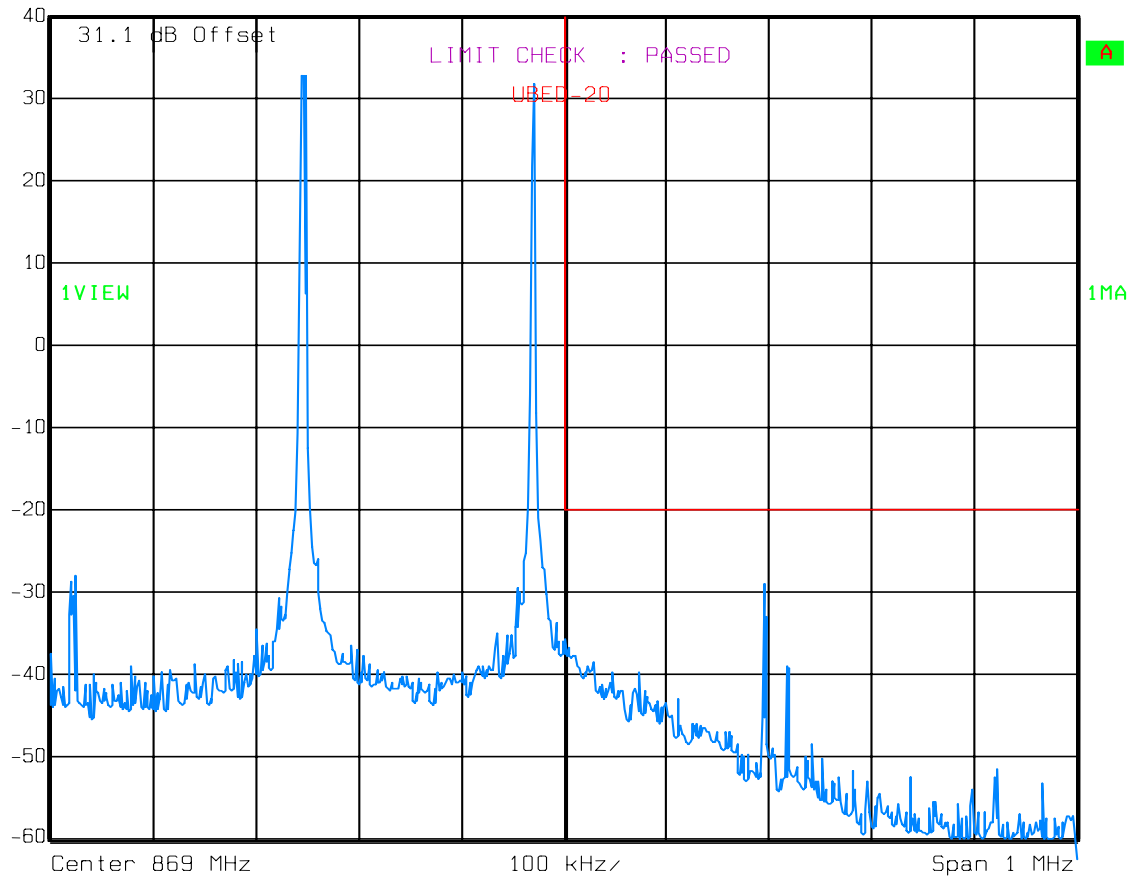
Upper Bandedge Intermodulation

Analog

Downlink

Ref Lvl
40 dBm

RBW	1 kHz	RF Att	20 dB
VBW	1 kHz	Mixer	-10 dBm
SWT	2.5 s	Unit	dBm



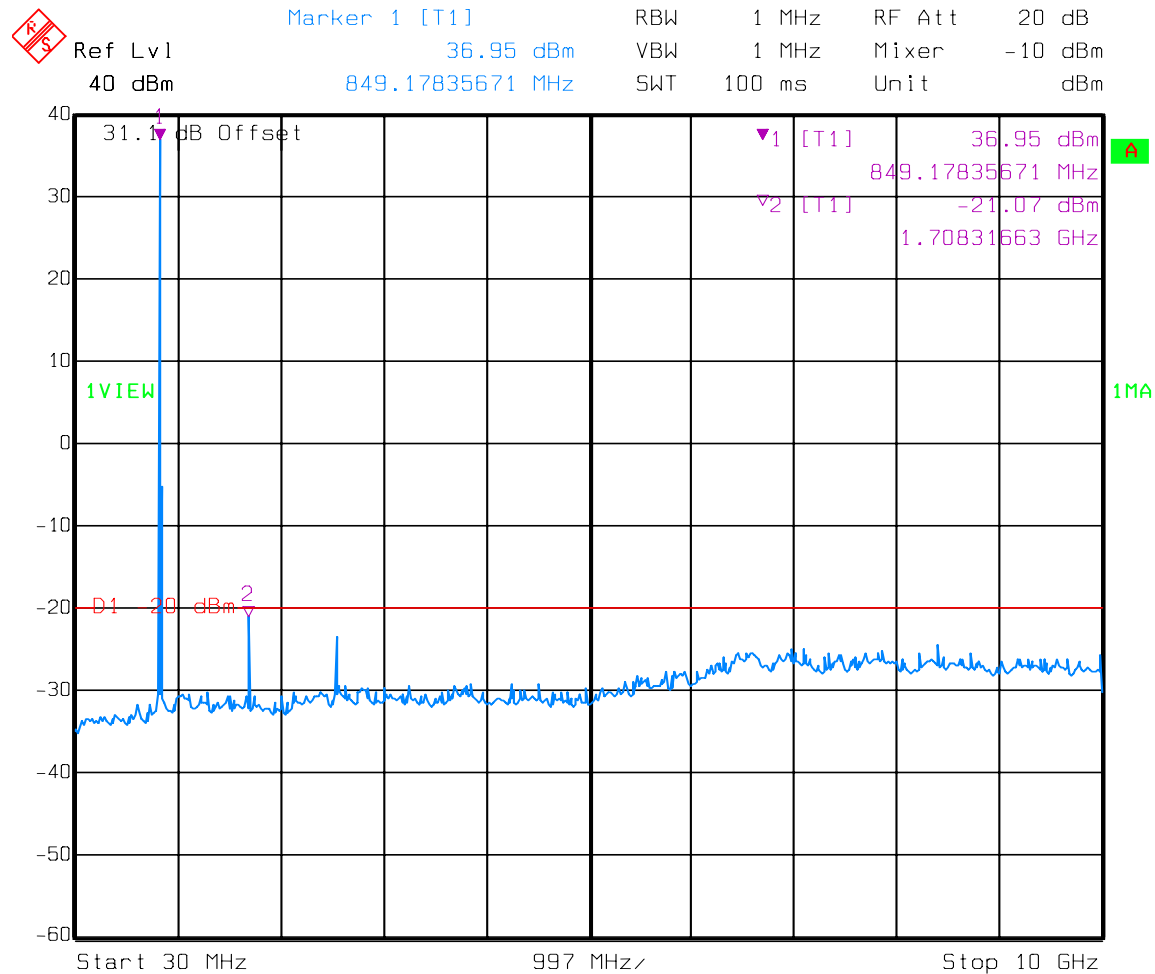
Date: 07.OCT.2008 09:15:32

EQUIPMENT: AF8037

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Test Data – Spurious Emissions at Antenna Terminals

Spurs – Analog - Downlink



Date: 07.OCT.2008 09:16:48

Test Data – Spurious Emissions at Antenna Terminals

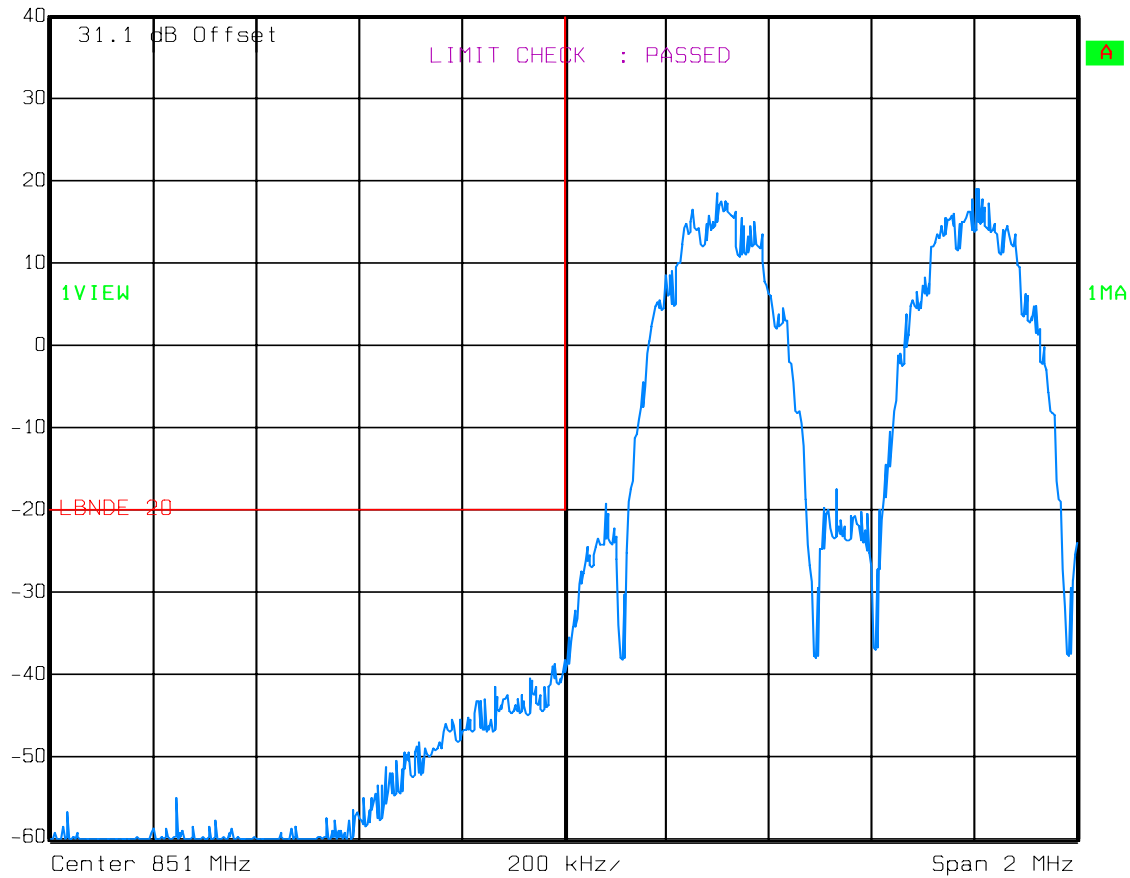
Lower Bandedge Intermodulation

iDEN

Downlink

Ref Lvl
40 dBm

RBW	1 kHz	RF Att	20 dB
VBW	1 kHz		
SWT	5 s	Unit	dBm



Date: 07.OCT.2008 10:26:01

Test Data – Spurious Emissions at Antenna Terminals

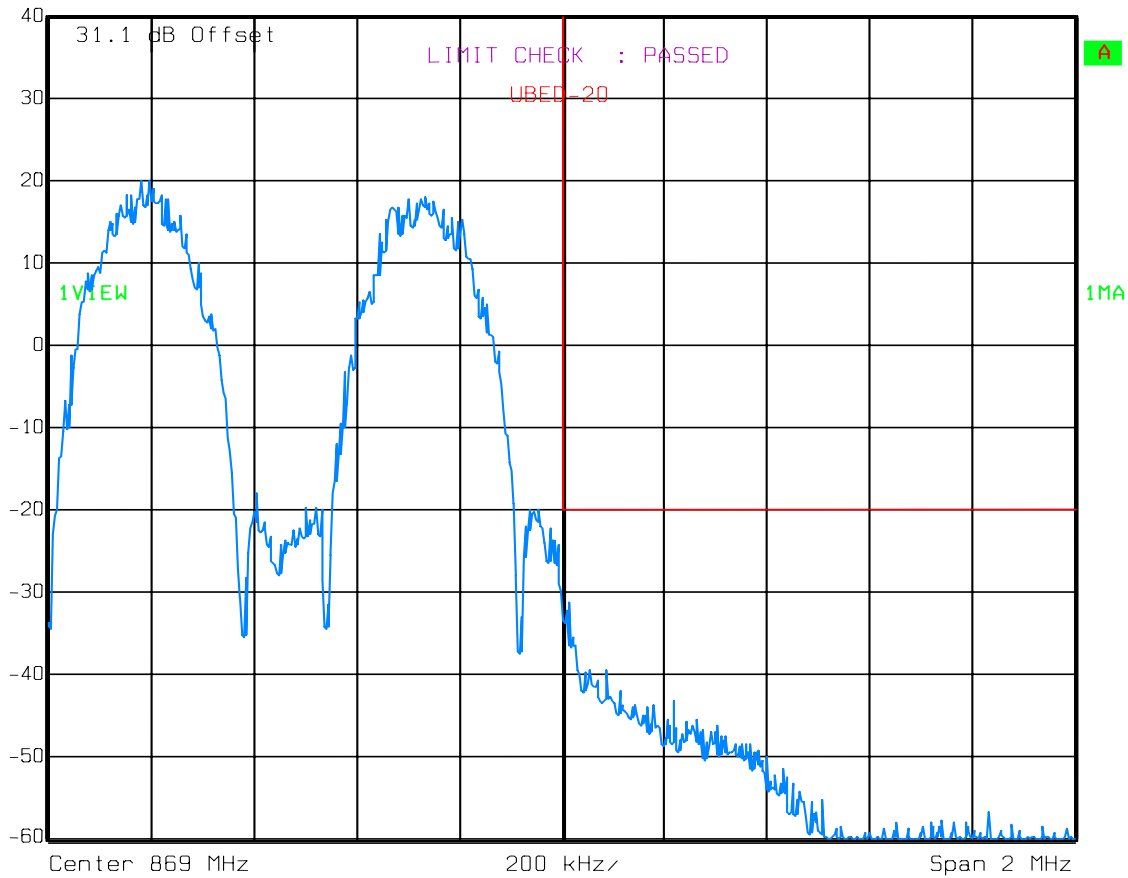
Upper Bandedge Intermodulation

iDEN

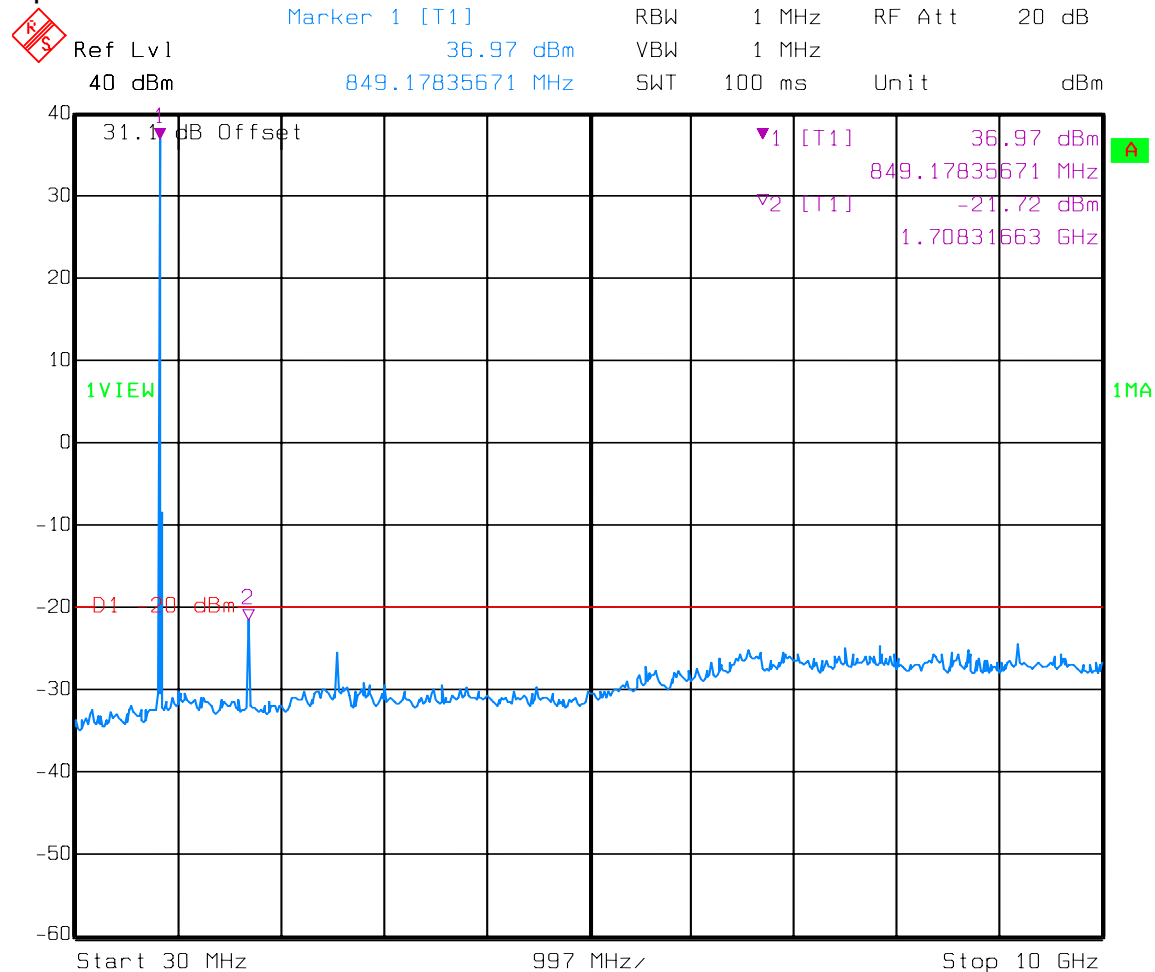
Downlink

Ref Lvl
40 dBm

RBW	1 kHz	RF Att	20 dB
VBW	1 kHz		
SWT	5 s	Unit	dBm



Date: 07.OCT.2008 10:25:05

Test Data – Spurious Emissions at Antenna Terminals**Spurs – iDEN - Downlink**

Date: 07.OCT.2008 10:50:00

Section 6. Field Strength of Spurious Emissions

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.993
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.

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 %

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

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: AF8037

PROJECT NO.: 16263RUS1

NAME OF TEST: Occupied Bandwidth

PARA. NO.: 2.989

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

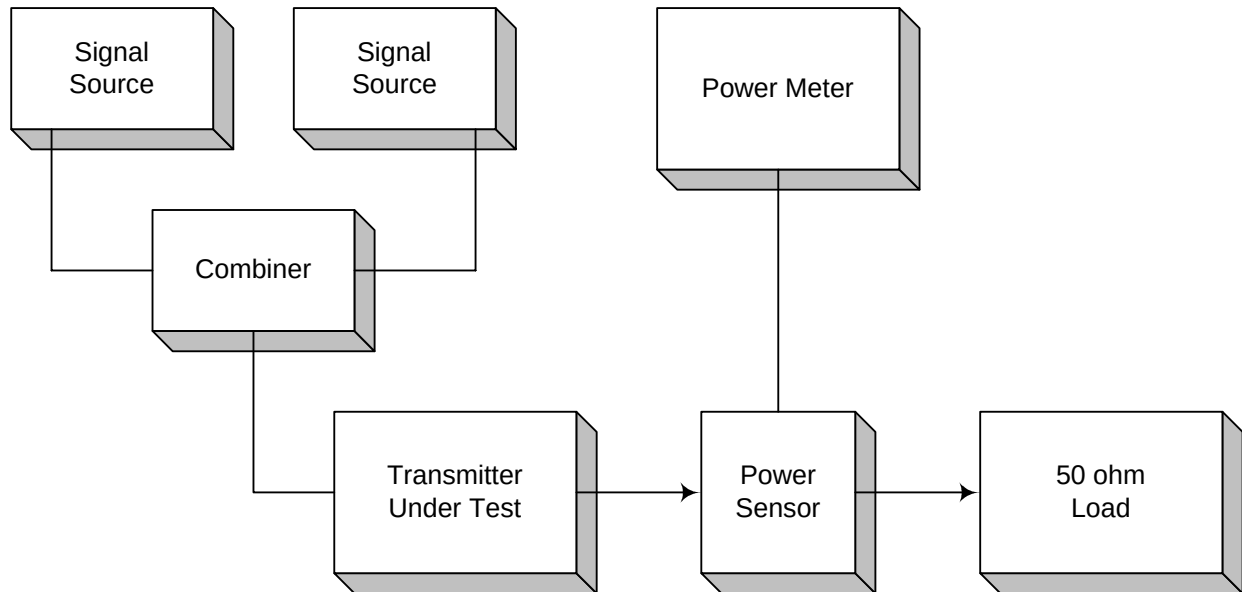
within the assigned frequency below in ppm.

Table 2

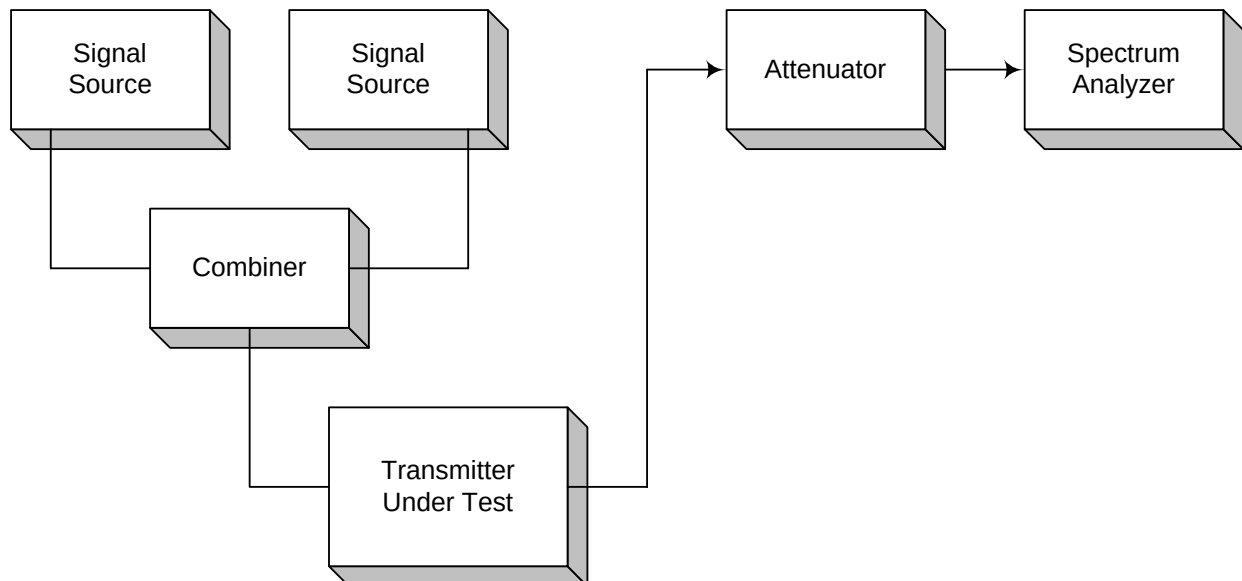
Frequency Band (MHz)	Fixed And Base Stations	Mobile Stations	
		> 2 Watts o/p pwr	< 2 Watts o/p pwr
Below 25	100	100	200
25 - 50	20	20	50
72 - 76	5	-	50
150 - 174	5	5	5
220 - 222	0.1	1.5	1.5
421 - 512	2.5	5	5
806 - 821	1.5	2.5	2.5
821 - 824	1.0	1.5	15
851 - 866	1.5	2.5	2.5
866 - 869	1.0	1.5	1.5
869 -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

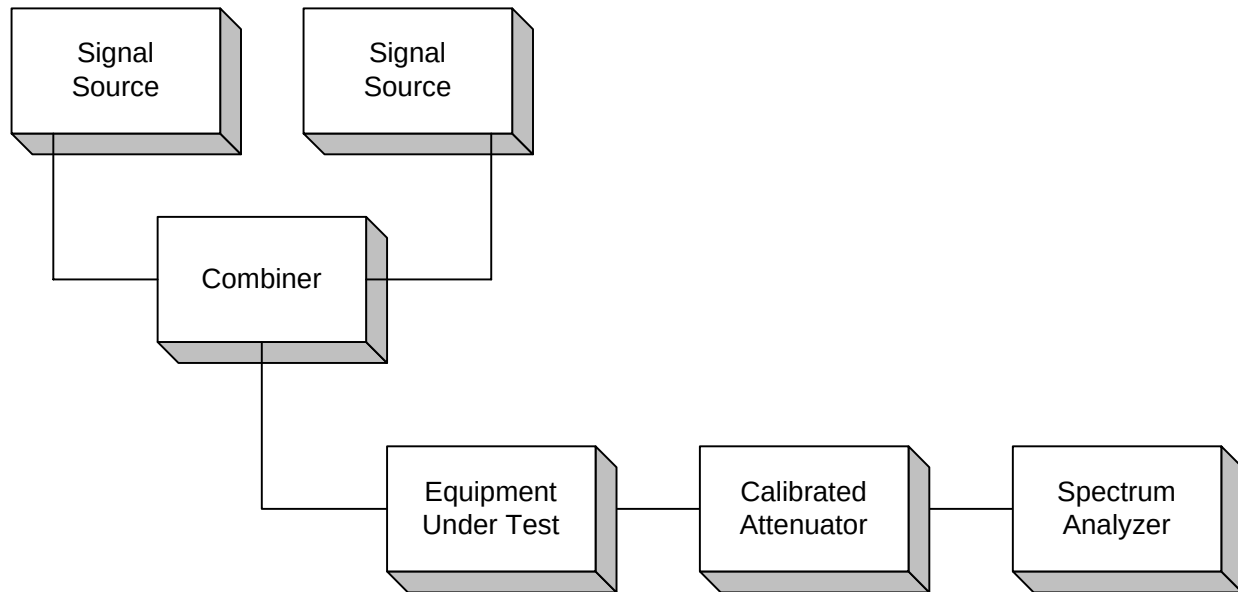
Para. No. 2.985 - R.F. Power Output



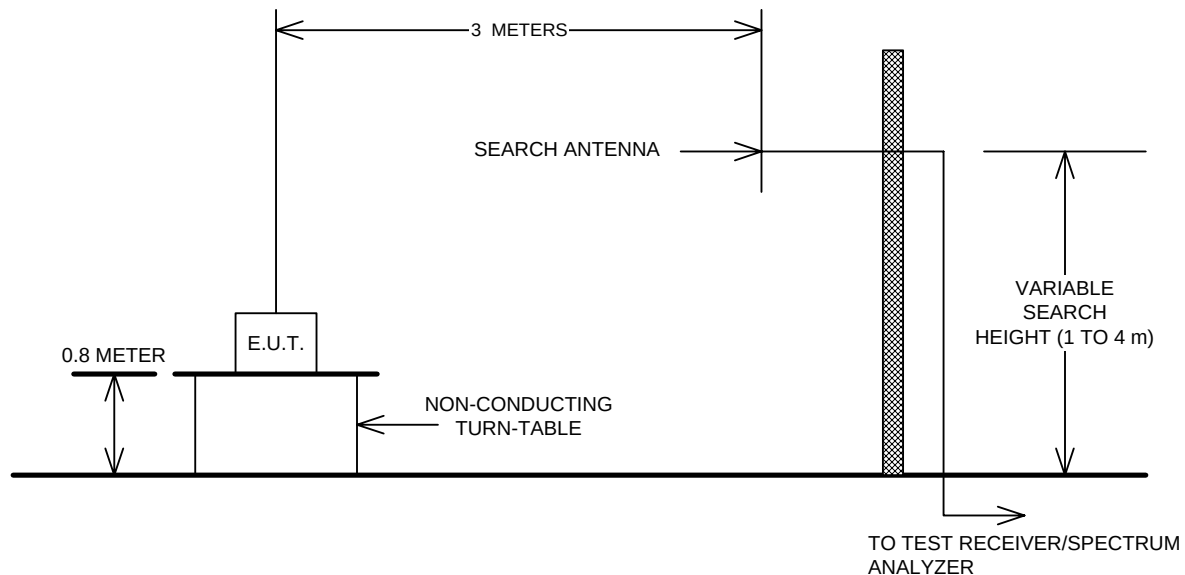
Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 - Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability

