Nemko Test Report: 6L0432RUS9rev1

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

Equipment Under Test: (E.U.T.) AMR906

In Accordance With:
CFR 47 Part 90, Subpart I
And
CFR 47 Part 24, Subpart D

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

TESTED BY: _____ **DATE:** **25 September 2006**
David Light Wireless Engineer

APPROVED BY: _____ **DATE:** **29 September 2006**
Kevin Rose Wireless Engineer

Number of Pages: 44

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Section 1. Summary of Test Results

Manufacturer: Andrew Corporation

Model No.: AMR906

Serial No.: None

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 90, Subpart I and Part 24, Subpart D.

☒ 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".

NVLAP®
LAB CODE: 100426-0

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	90.205	1000 W	Complies
RF Power Output	24.132	7 W	Complies
Occupied Bandwidth	90.210	Input/Output	Complies
Occupied Bandwidth	Not specified	Input/Output	Complies
Spurious Emissions at Antenna Terminals	90.210	Plots	Complies
Spurious Emissions at Antenna Terminals	24.133	-13 dBm	Complies
Field Strength of Spurious Emissions	90.210	-13 dBm	Complies
Field Strength of Spurious Emissions	24.133	-13 dBm	Complies
Frequency Stability	90.213	1 ppm	NA
Frequency Stability	24.135	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.

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Section 2. General Equipment Specification

Transmitter

Supply Voltage Input: 120 Vac

Frequency Range: **Downlink:** 935 to 941 MHz
Uplink: 896 to 902 MHz

Tunable Bands:

Type(s) of Modulation:

F3E/F1D (Analog)	D7W (QAM)	Other
☒	☒	☐

Gain: 89 dB Max

Output Impedance: 50 ohms

RF Power Output (rated):

DL:	0.50	W
	27	dBm
UL:	0.32	W
	25	dBm

Operator Selection of Operating Frequency: None

Power Output Adjustment Capability: ALC

Frequency Translation:

F1-F1	F1-F2	N/A
☒	☐	☐

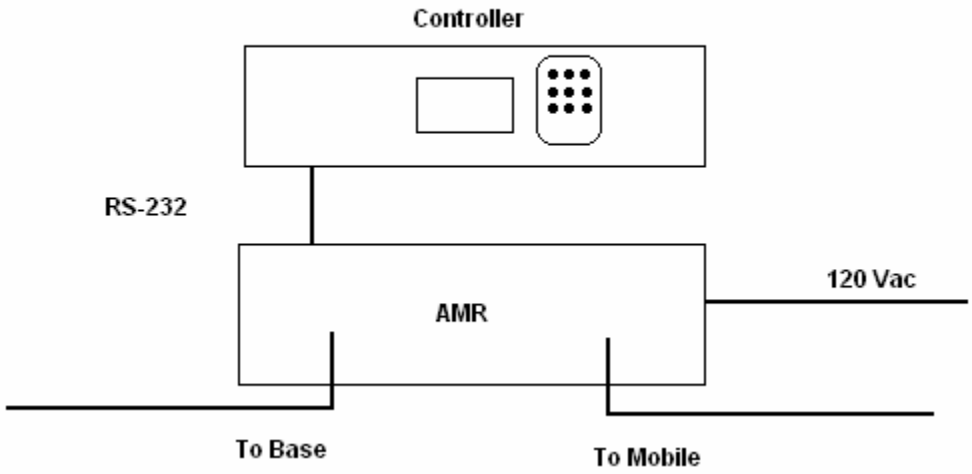
Band Selection:

Software	Duplexer Change	Fullband Coverage
☐	☐	☒

Description of EUT

Bi-directional amplifier used to enhance signals between a mobile and a base station in a wireless network. Typical applications are coverage improvement in small and medium sized environments such as offices, store fronts, underground floors, and small manufacturing facilities. The AMR family will automatically set its gain to maximize performance. However, an alphanumeric interface allows the user to manually set the gain if desired. ALC, Automatic Level Control, is incorporated to prevent overdriving the amplifier.

System Diagram



Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: David Light	DATE: 25 August 2006

Test Results: Complies.

Measurement Data:

Direction	Modulation	Output per Channel (dBm)	Composite Power (dBm)	Composite Power (W)
Uplink	Analog	22.03	25.03	0.32
Downlink	Analog	24.01	27.01	0.50
Uplink	iDEN	22.05	25.05	0.32
Downlink	iDEN	24.02	27.02	0.50

Equipment Used: 1082-1469-1472-1659

Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 31 %

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1049
TESTED BY: David Light	DATE: 25 August 25 2006

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1082-1469-1472-1659-1036

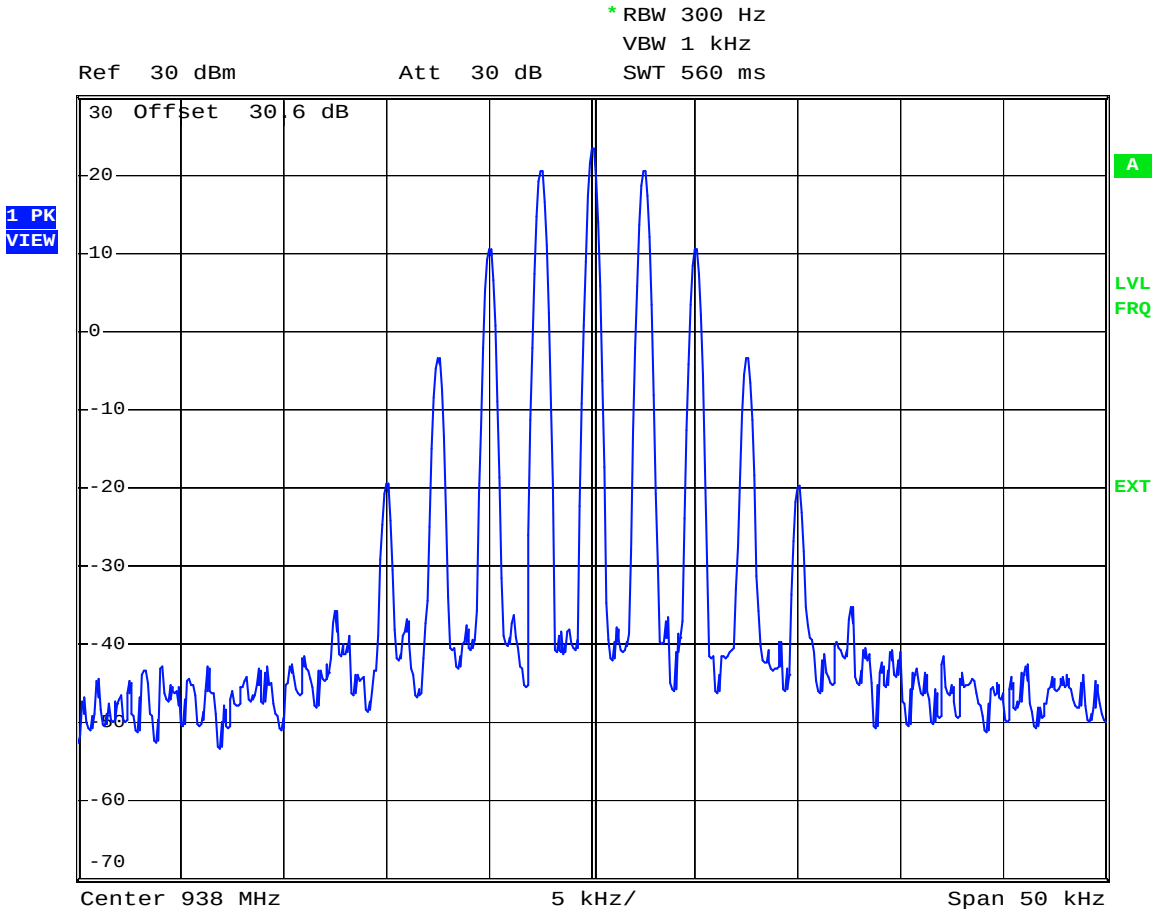
Measurement Uncertainty: $1X10^{-7}$ ppm

Temperature: 22 °C

Relative Humidity: 31 %

Test Data – Occupied Bandwidth

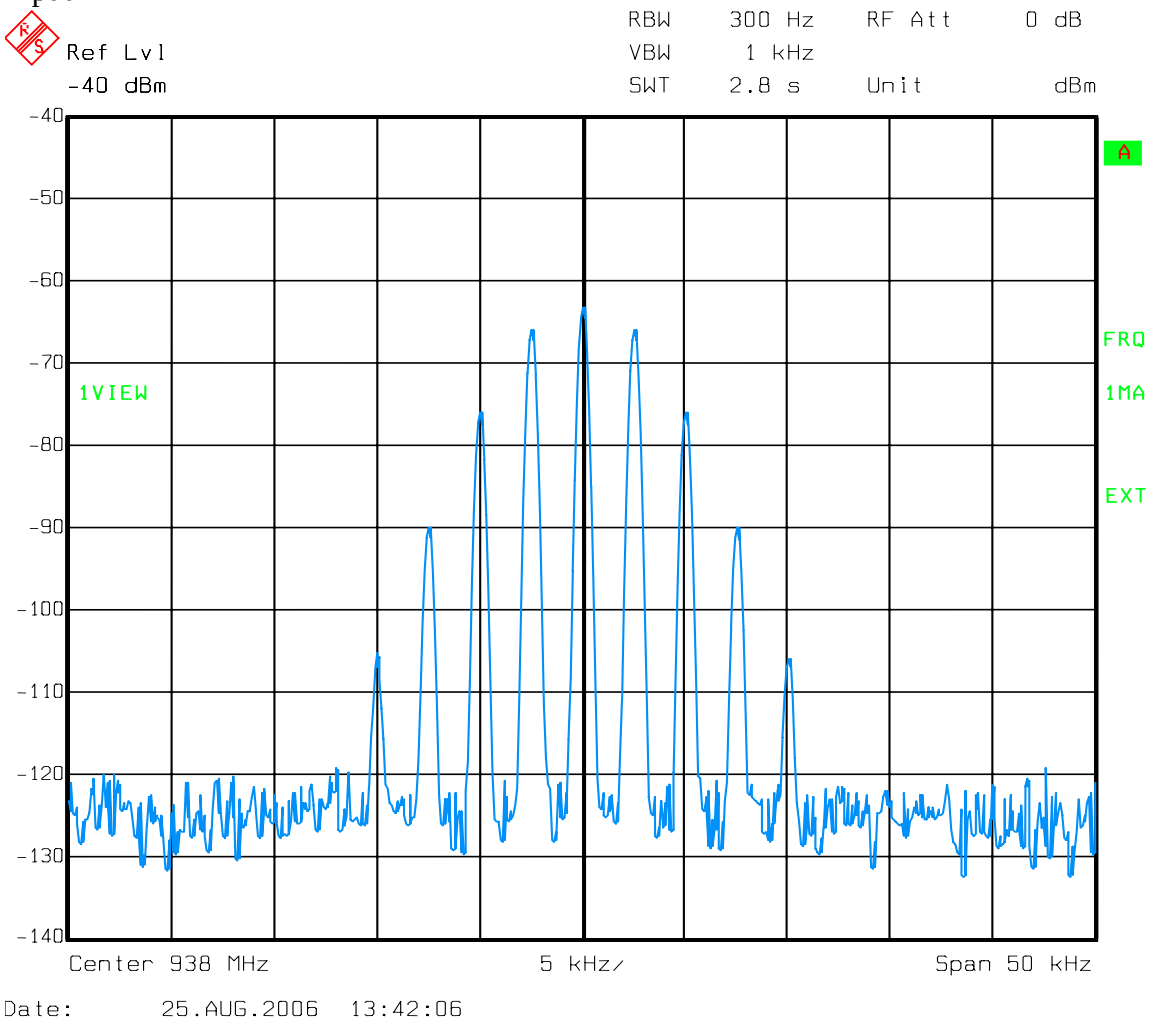
OBW – DL
Analog
2.5 kHz Tone/3 kHz Deviation
Output



Date: 25.AUG.2006 13:44:40

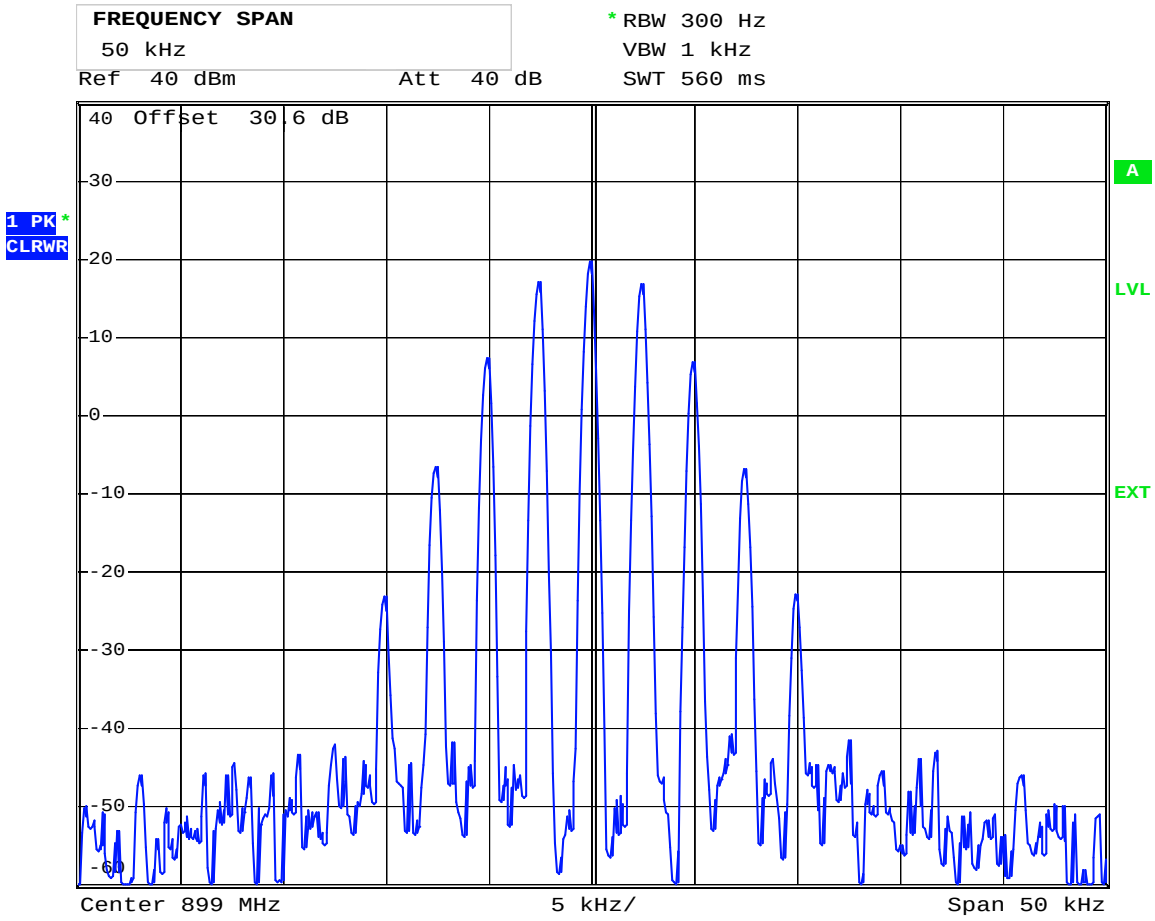
Test Data – Occupied Bandwidth

OBW – DL
Analog
Input



Test Data – Occupied Bandwidth

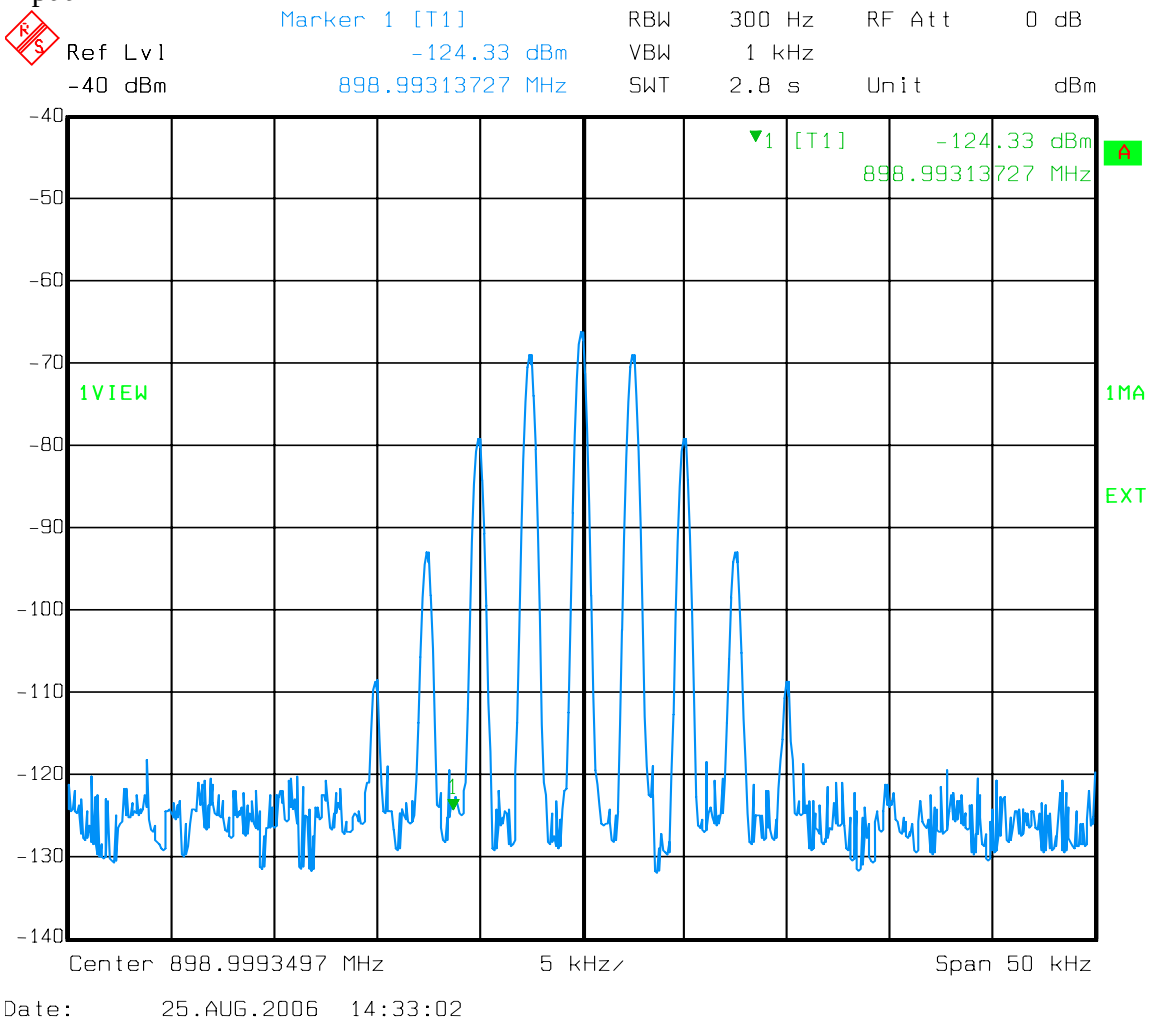
OBW – UL
Analog
2.5 kHz Tone/3 kHz Deviation
Output



Date: 25.AUG.2006 14:37:59

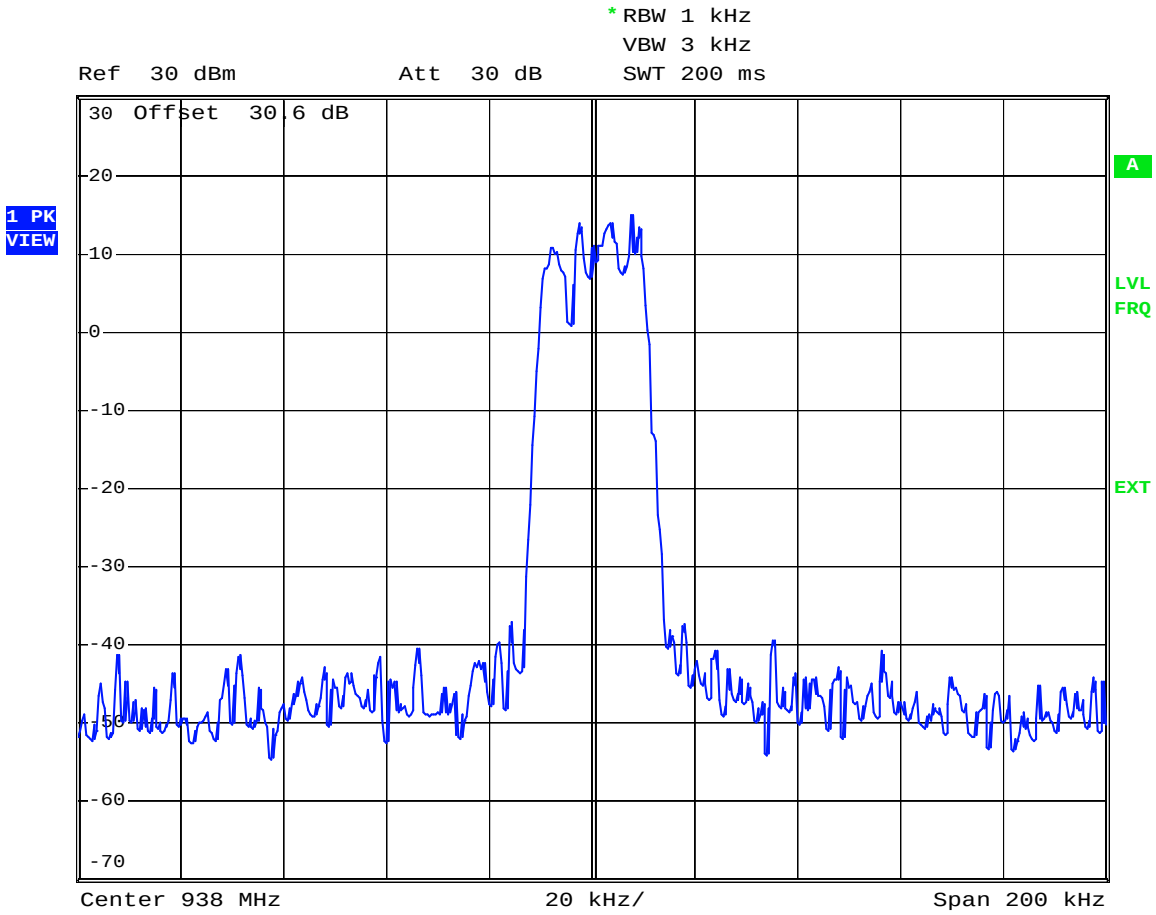
Test Data – Occupied Bandwidth

OBW – UL
Analog
Input



Test Data – Occupied Bandwidth

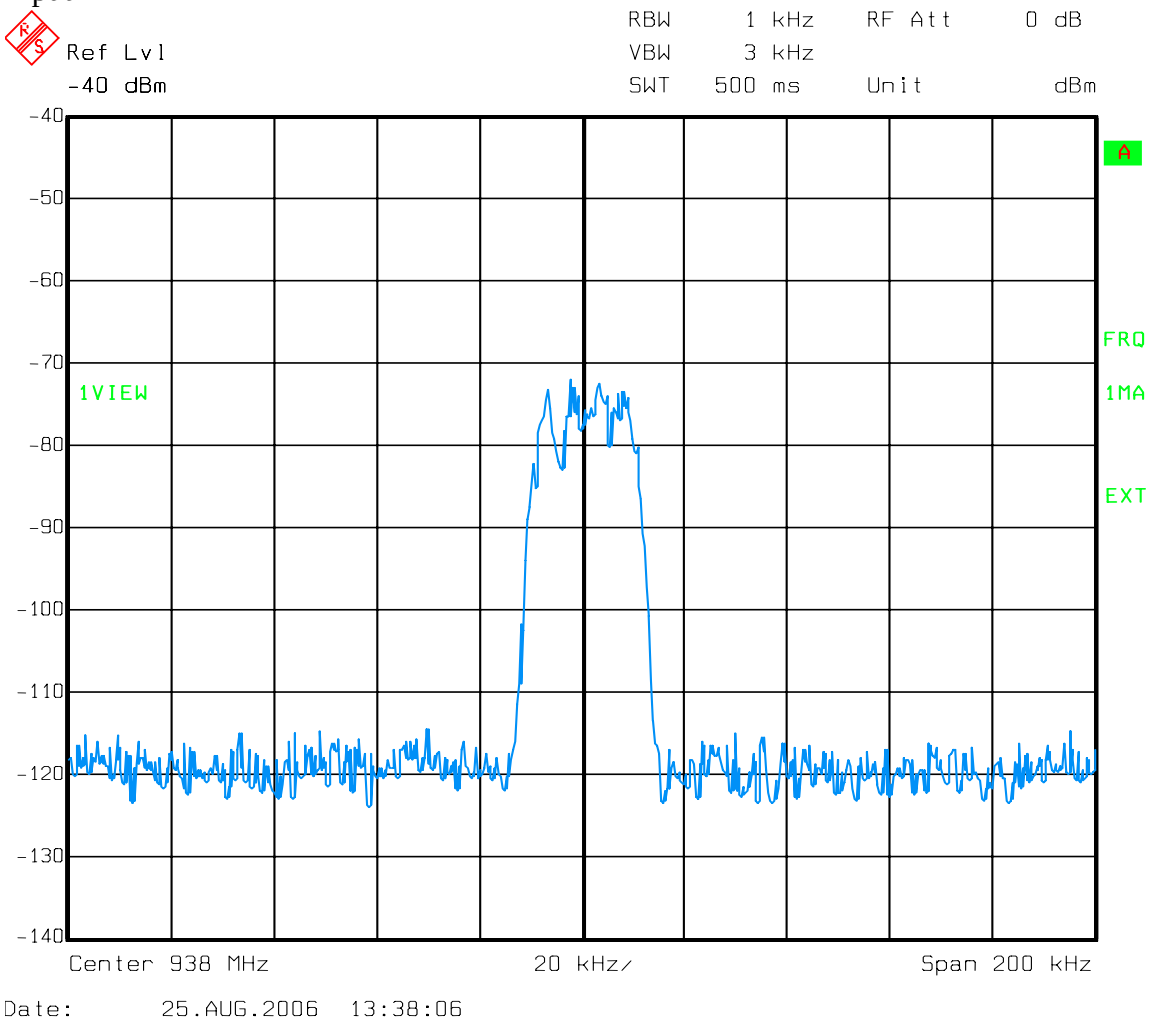
OBW – DL
iDEN
Output



Date: 25.AUG.2006 13:42:17

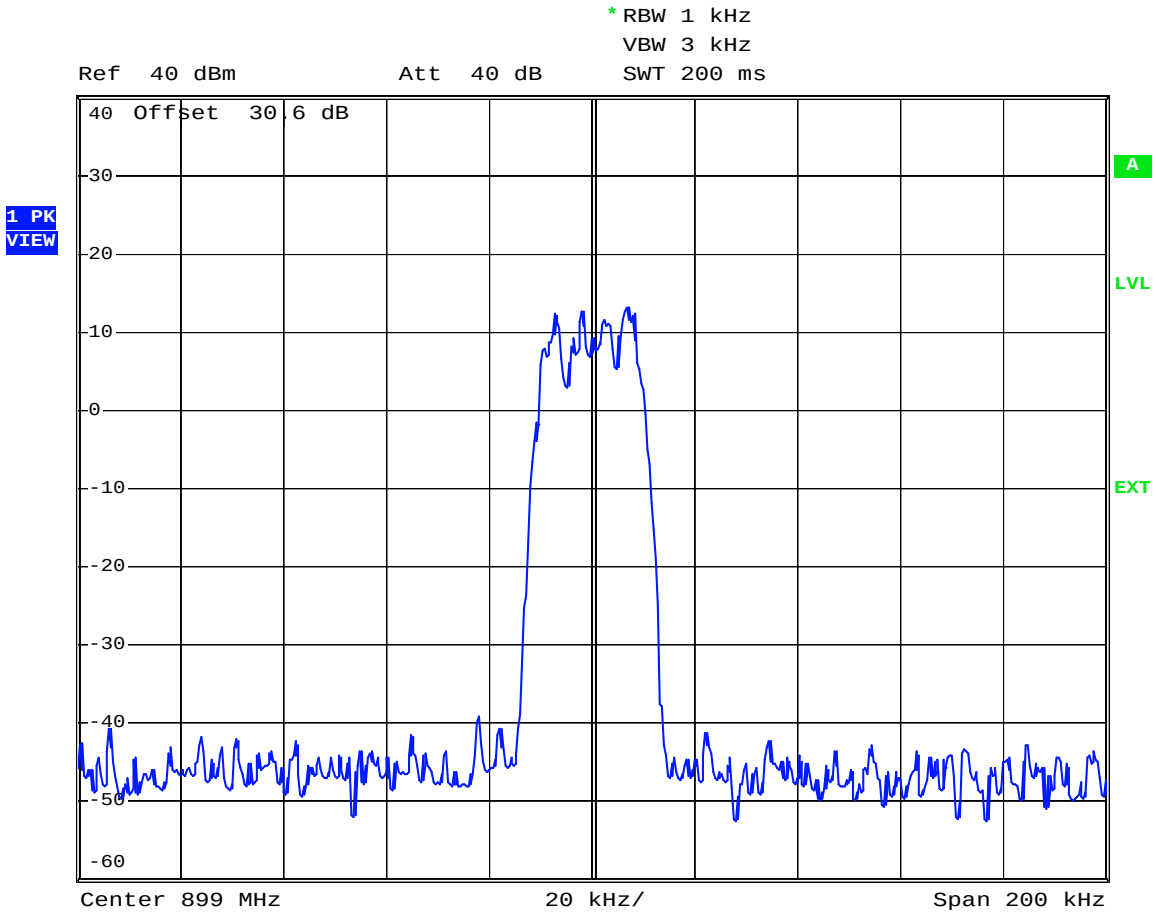
Test Data – Occupied Bandwidth

OBW – DL
iDEN
Input



Test Data – Occupied Bandwidth

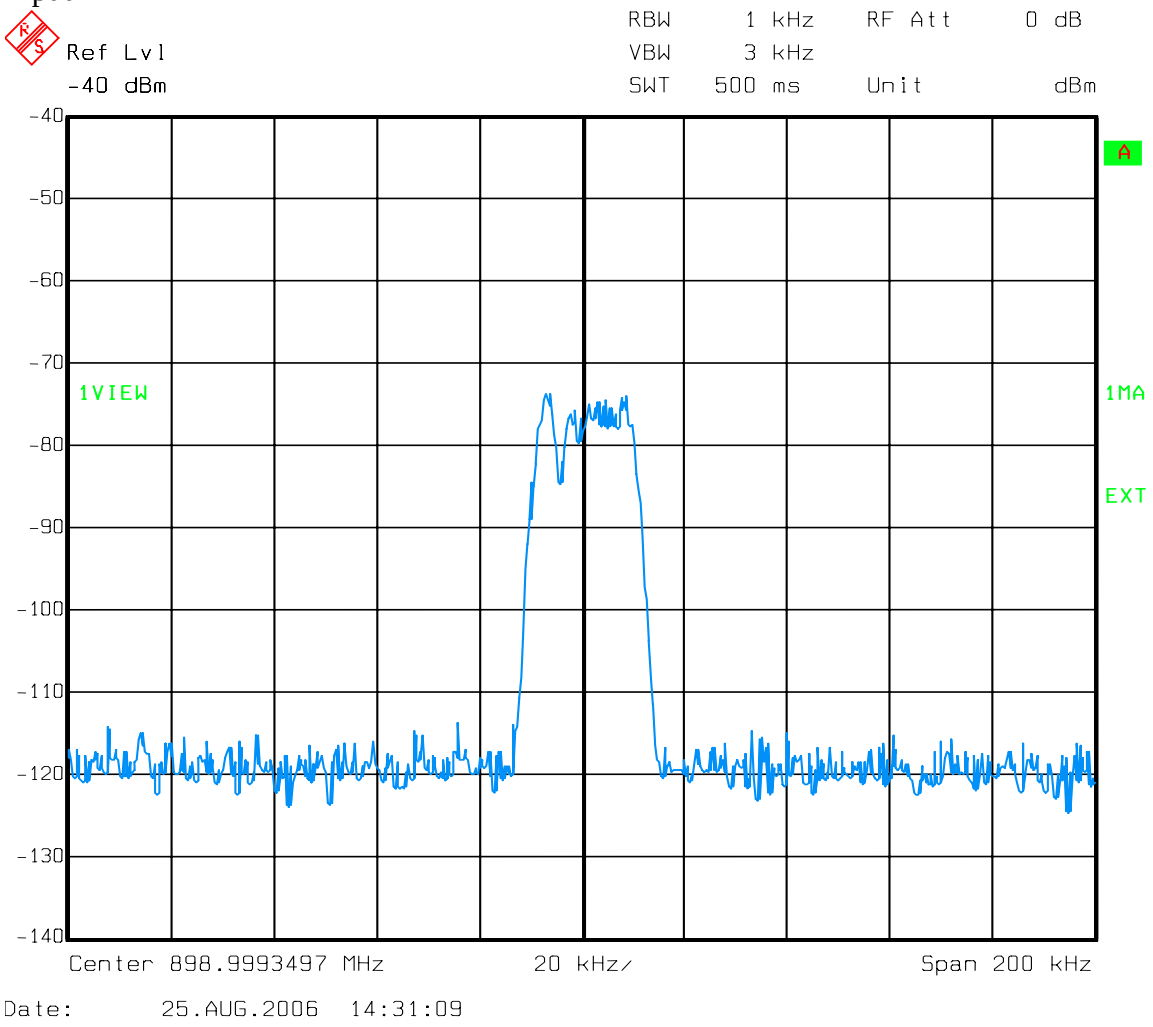
OBW – UL
iDEN
Output



Date: 25.AUG.2006 14:35:18

Test Data – Occupied Bandwidth

OBW – UL
iDEN
Input



Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.1051
TESTED BY:	DATE: 25 Aug 2006

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1082-1469-1472-1036-1659

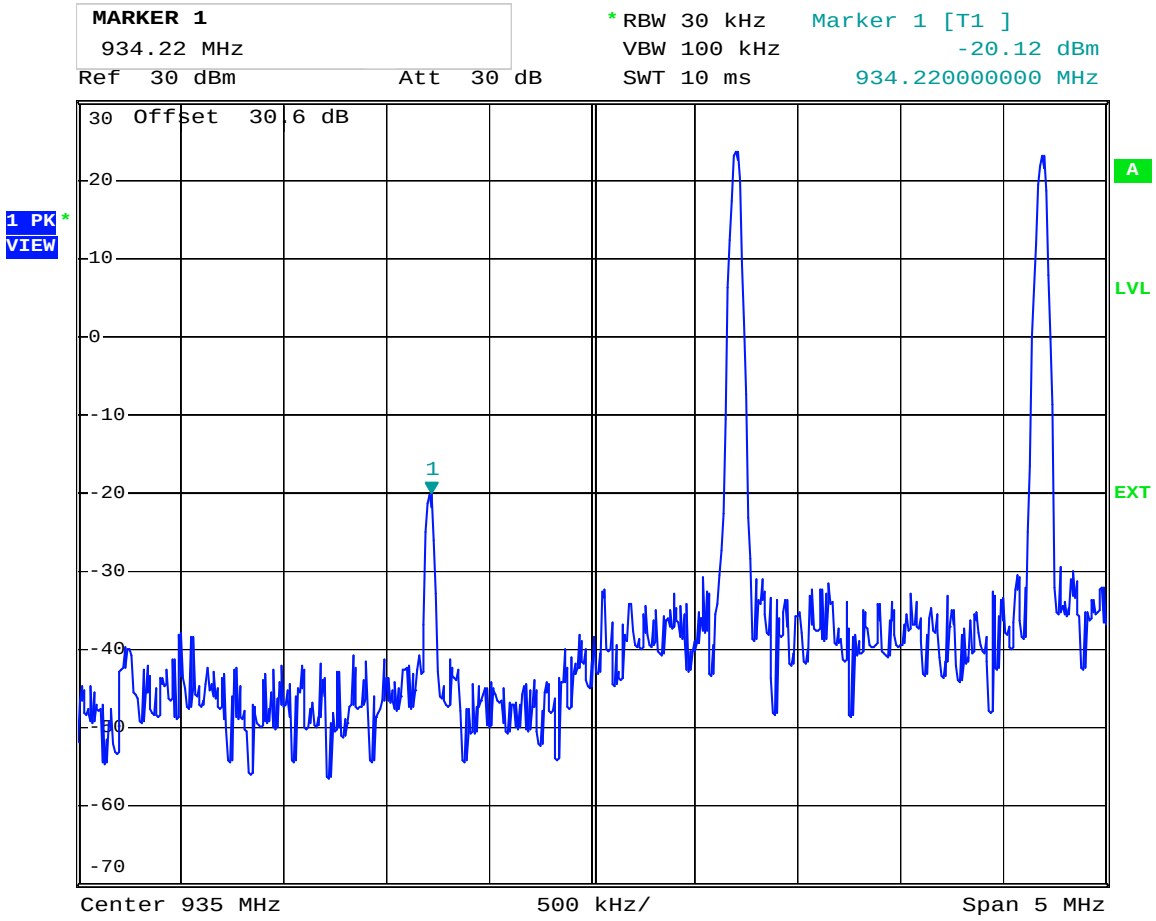
Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 31 %

Test Data – Spurious Emissions at Antenna Terminals

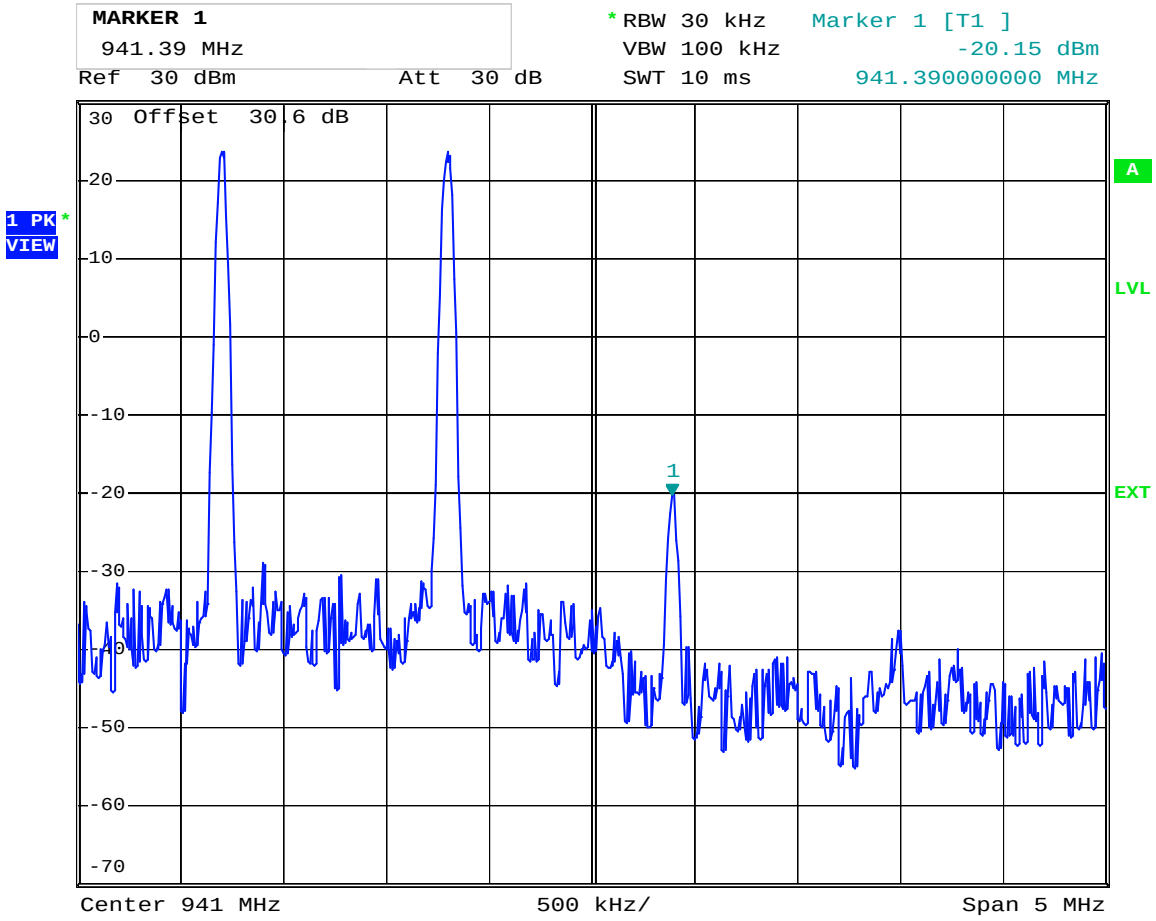
Lower Bandedge Intermodulation
Analog
Downlink



Date: 25.AUG.2006 14:06:13

Test Data – Spurious Emissions at Antenna Terminals

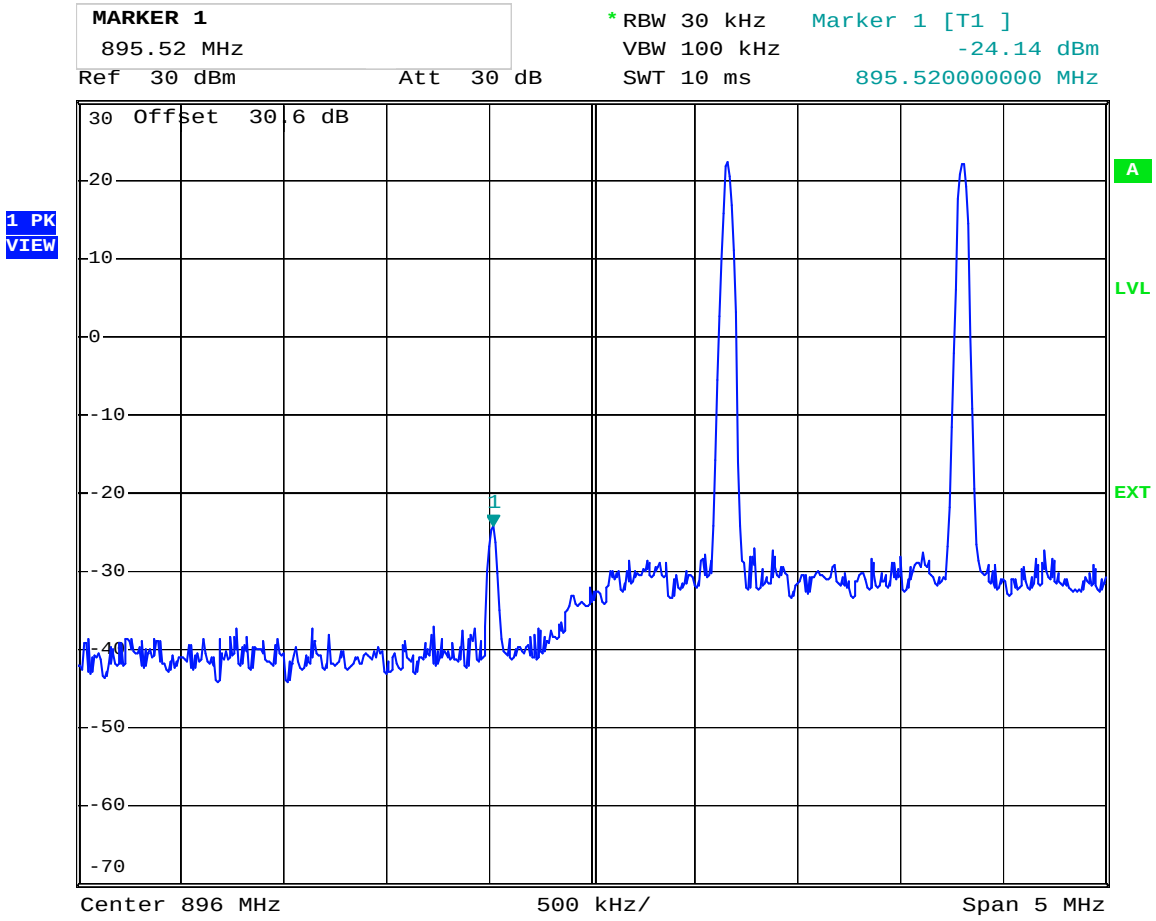
Upper Bandedge Intermodulation
Analog
Downlink



Date: 25.AUG.2006 14:08:12

Test Data – Spurious Emissions at Antenna Terminals

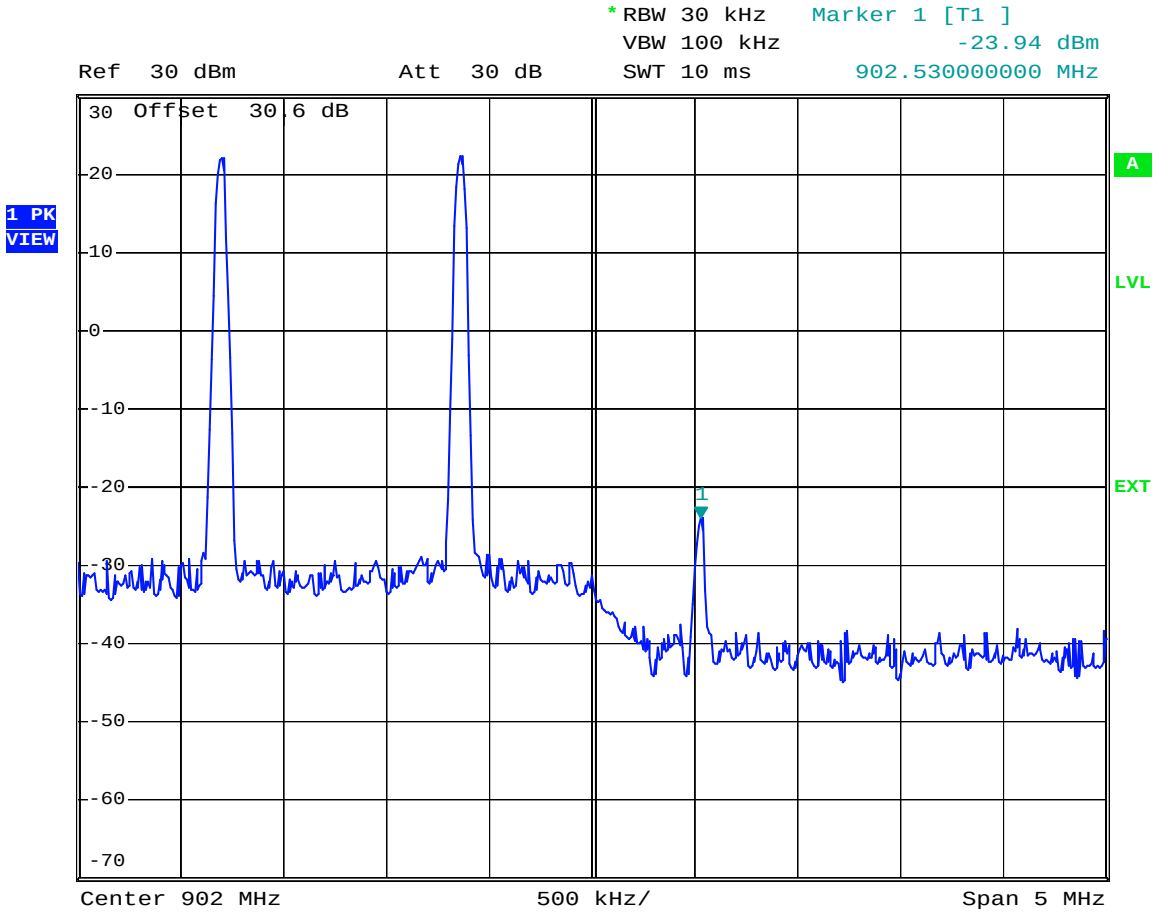
Lower Bandedge Intermodulation
Analog
Uplink



Date: 25.AUG.2006 14:51:47

Test Data – Spurious Emissions at Antenna Terminals

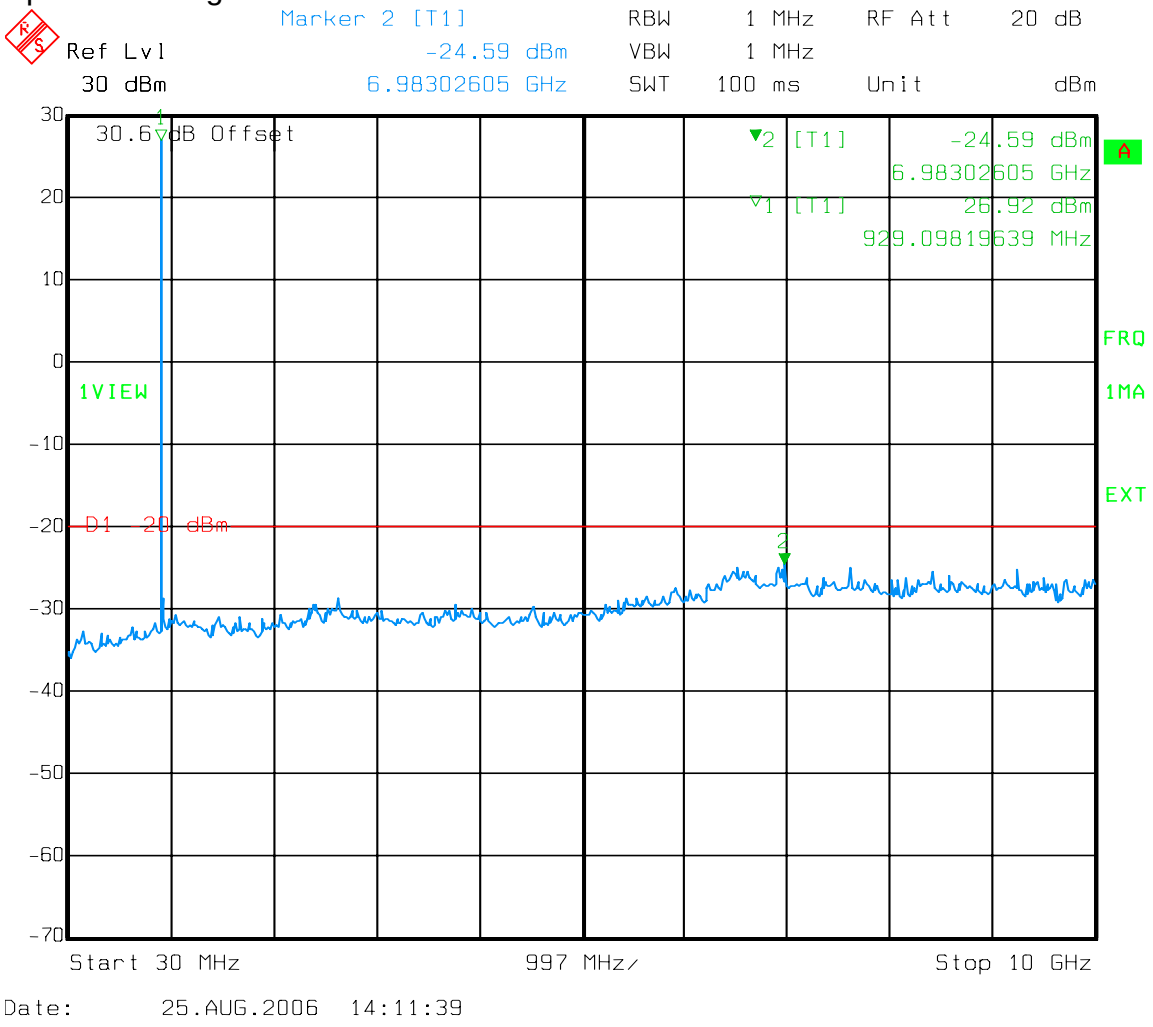
Upper Bandedge Intermodulation
Analog
Uplink



Date: 25.AUG.2006 14:50:07

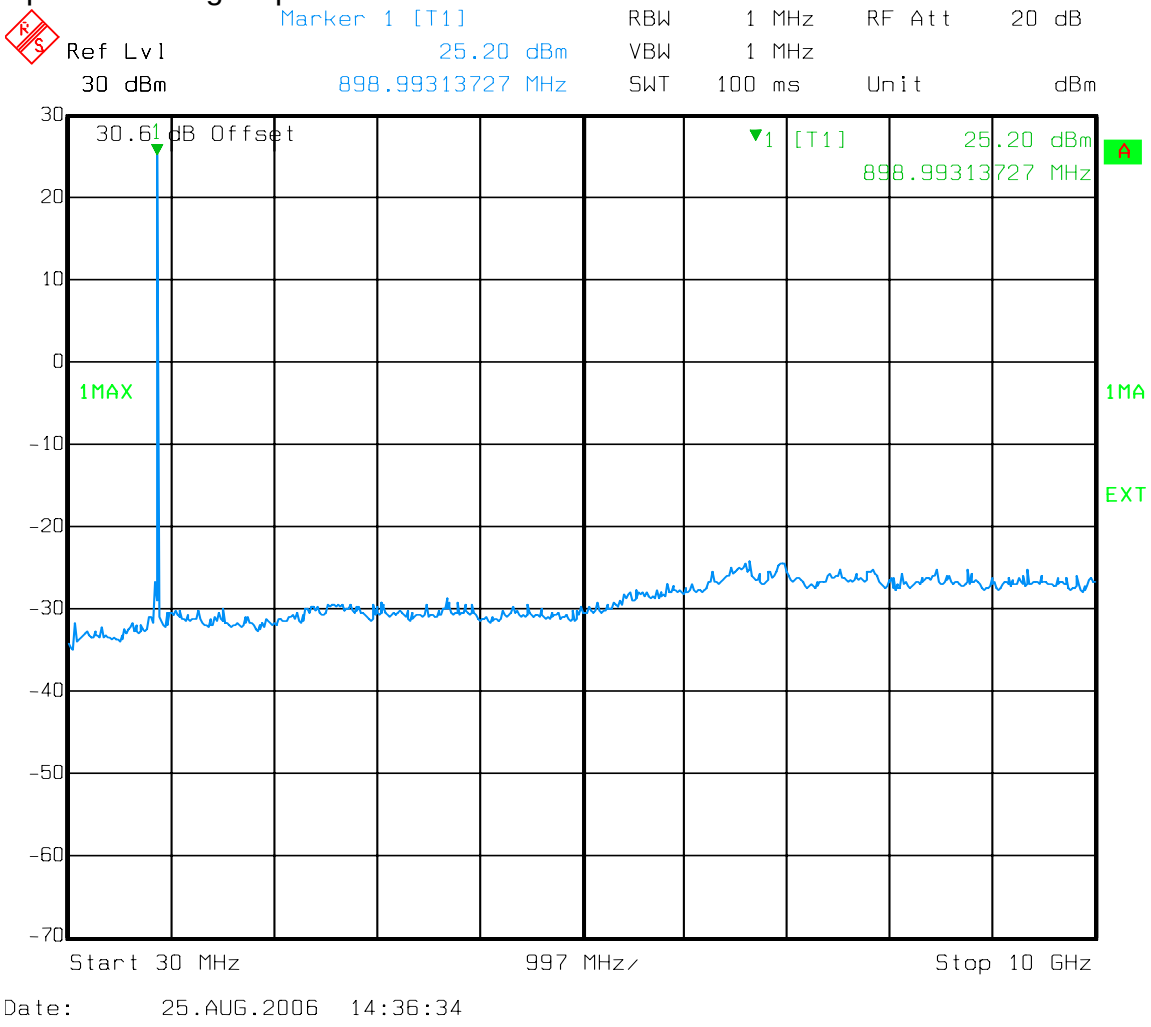
Test Data – Spurious Emissions at Antenna Terminals

Spurs – Analog - Downlink



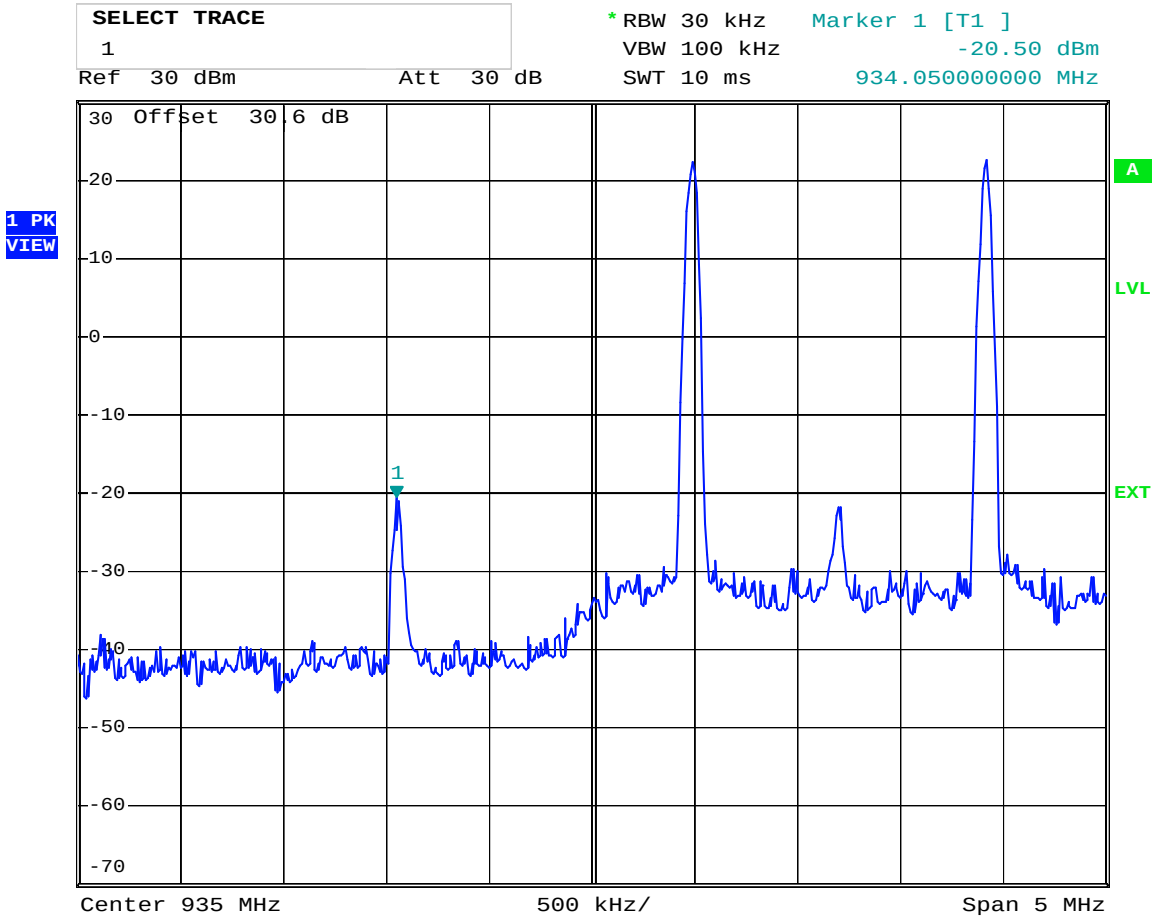
Test Data – Spurious Emissions at Antenna Terminals

Spurs – Analog - Uplink



Test Data – Spurious Emissions at Antenna Terminals

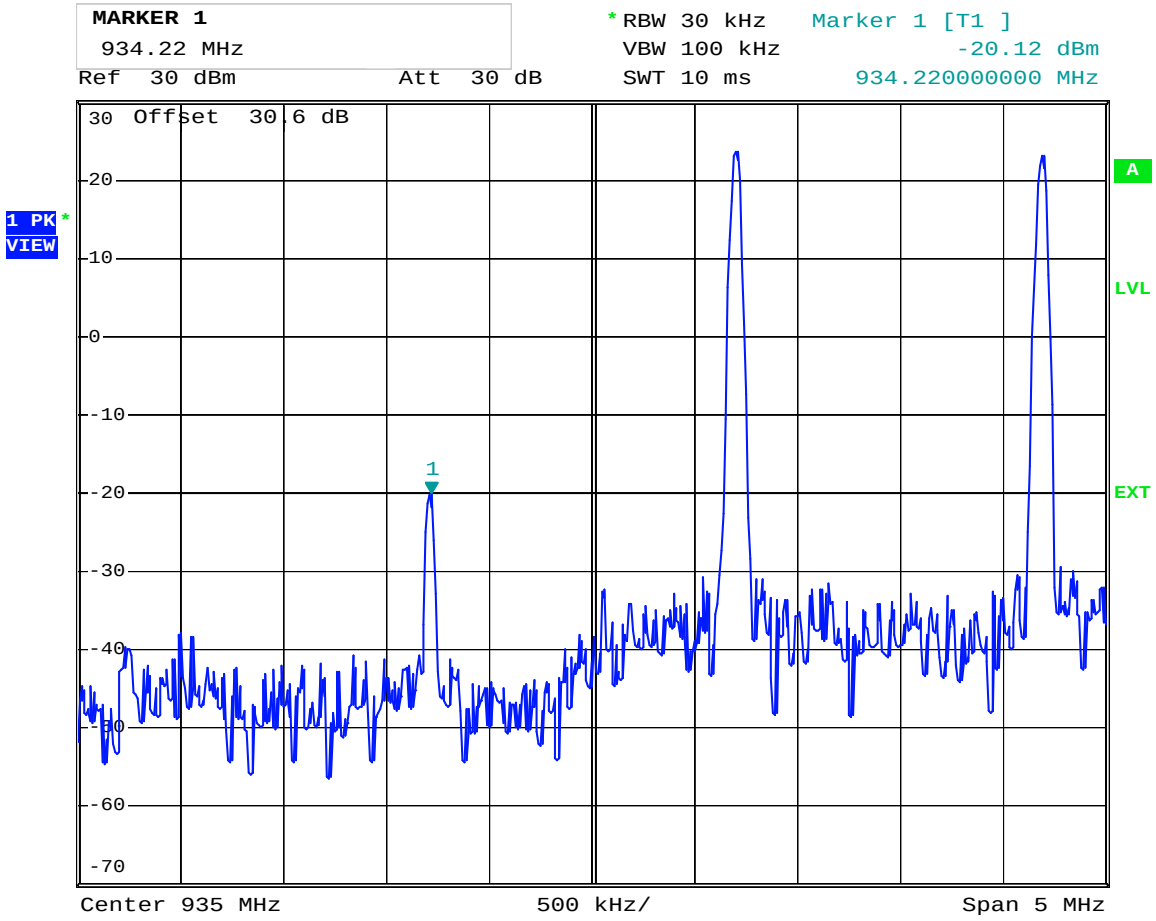
Lower Bandedge Intermodulation
iDEN
Downlink



Date: 25.AUG.2006 14:03:13

Test Data – Spurious Emissions at Antenna Terminals

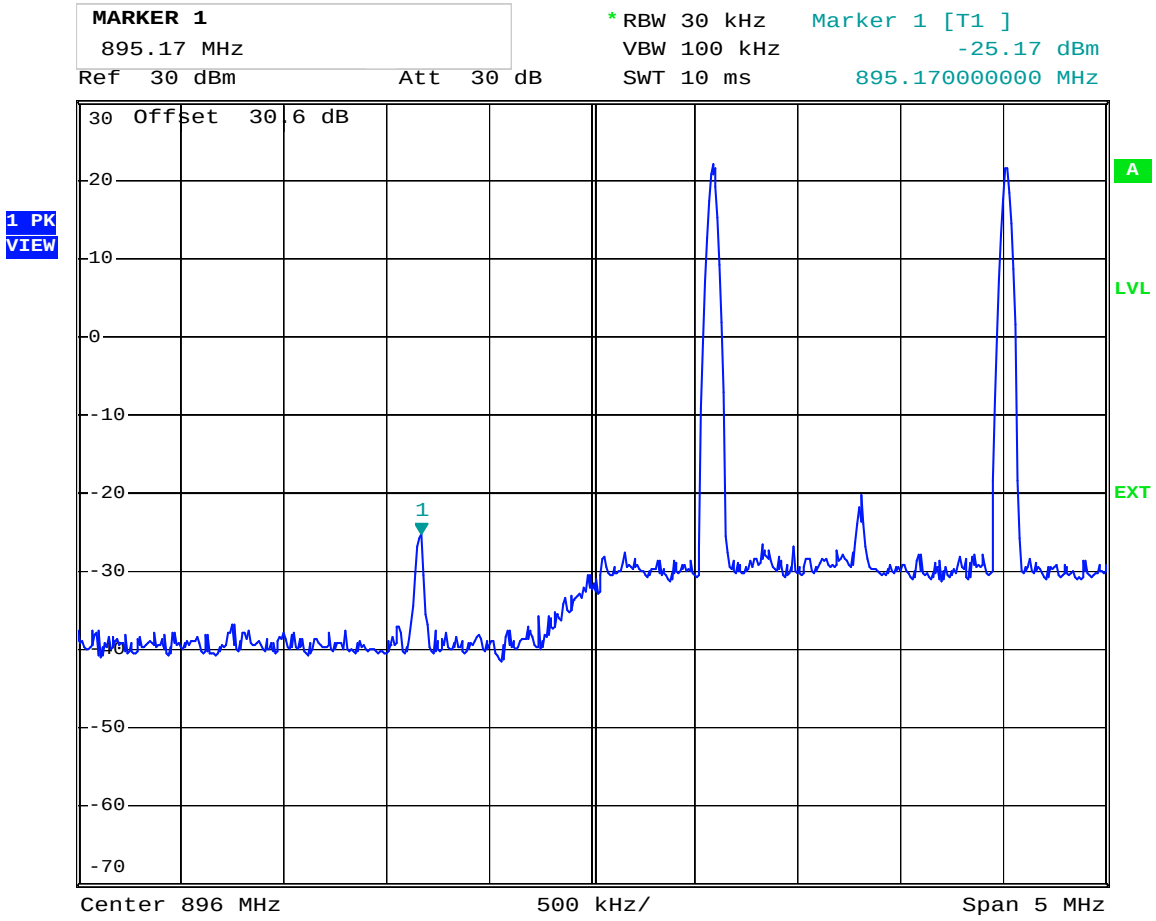
Upper Bandedge Intermodulation
iDEN
Downlink



Date: 25.AUG.2006 14:06:13

Test Data – Spurious Emissions at Antenna Terminals

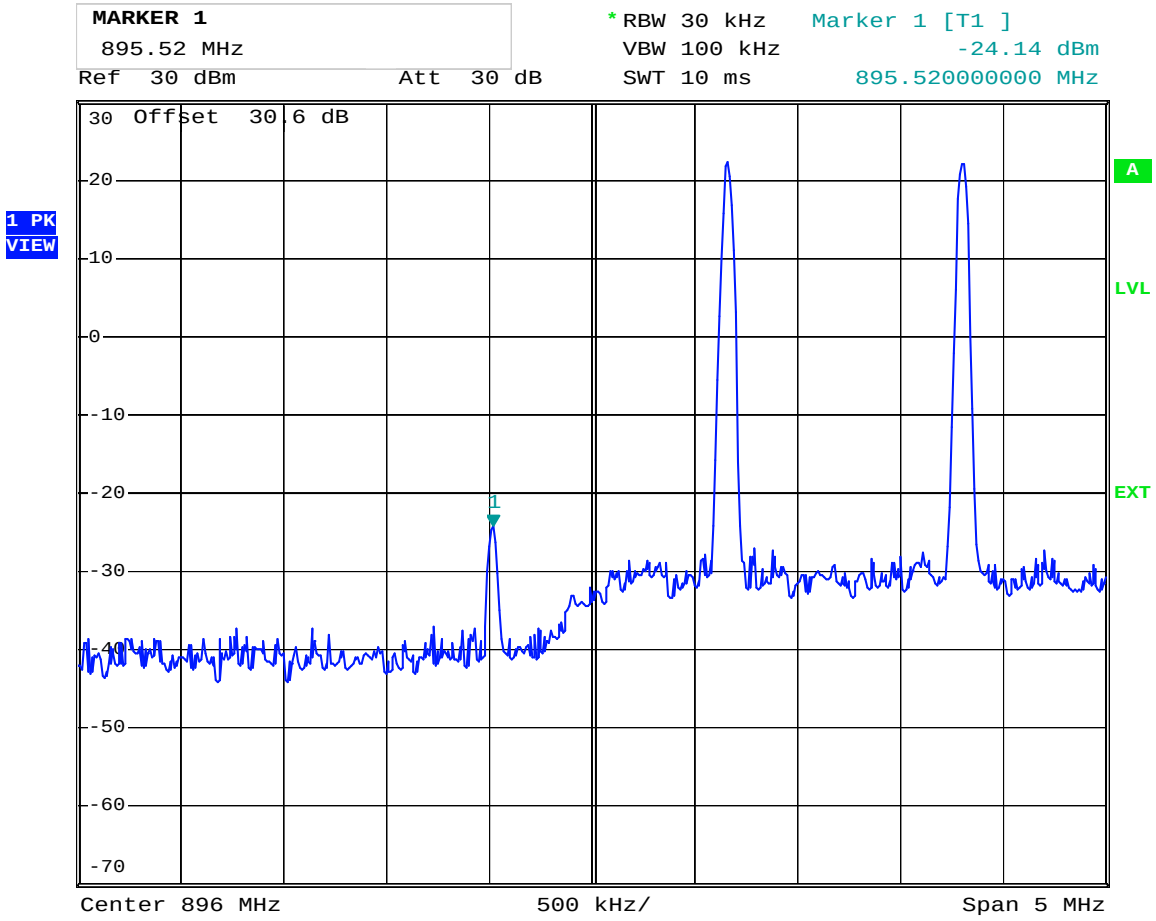
Lower Bandedge Intermodulation
iDEN
Uplink



Date: 25.AUG.2006 14:46:51

Test Data – Spurious Emissions at Antenna Terminals

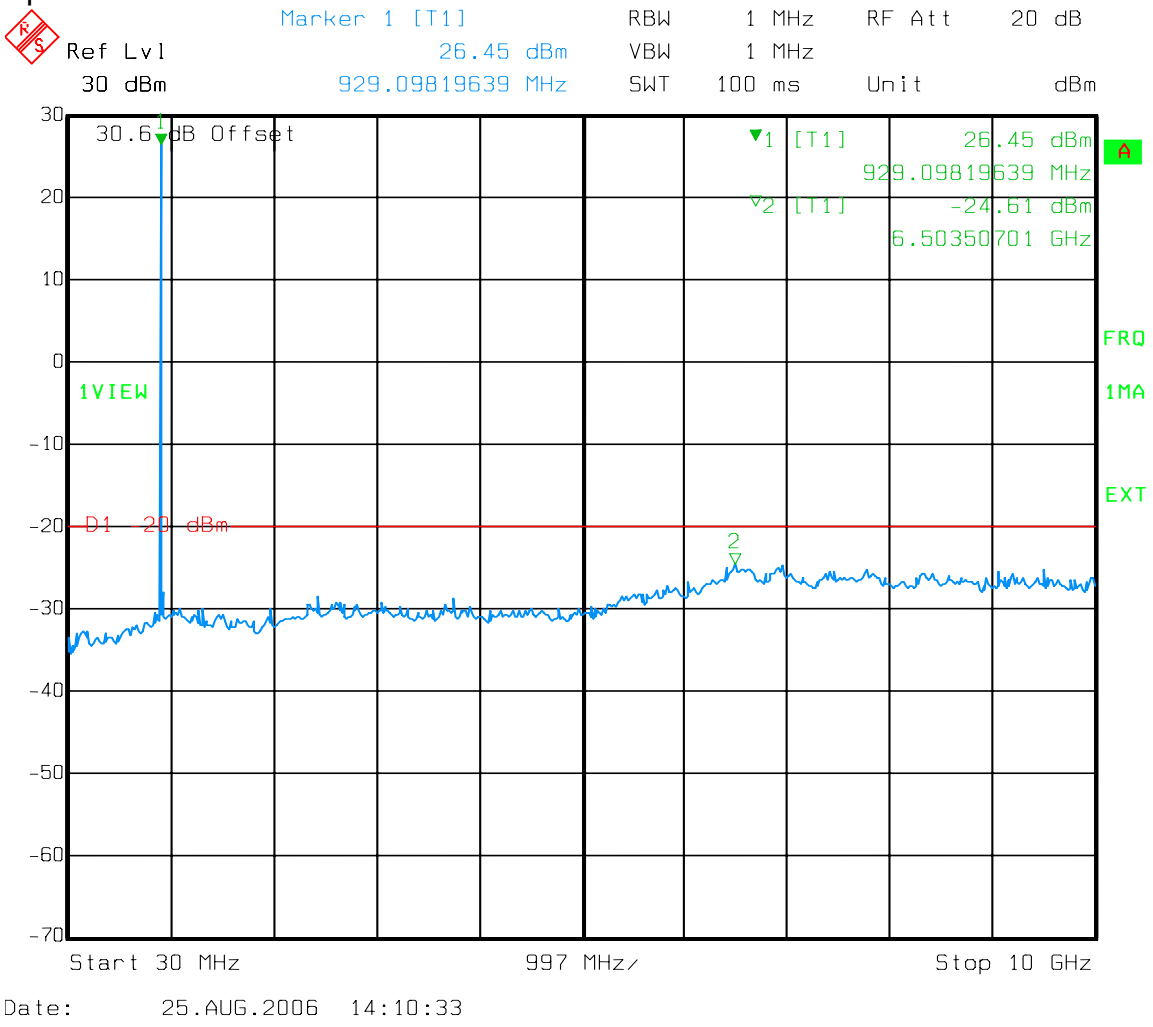
Upper Bandedge Intermodulation
iDEN
Uplink



Date: 25.AUG.2006 14:51:47

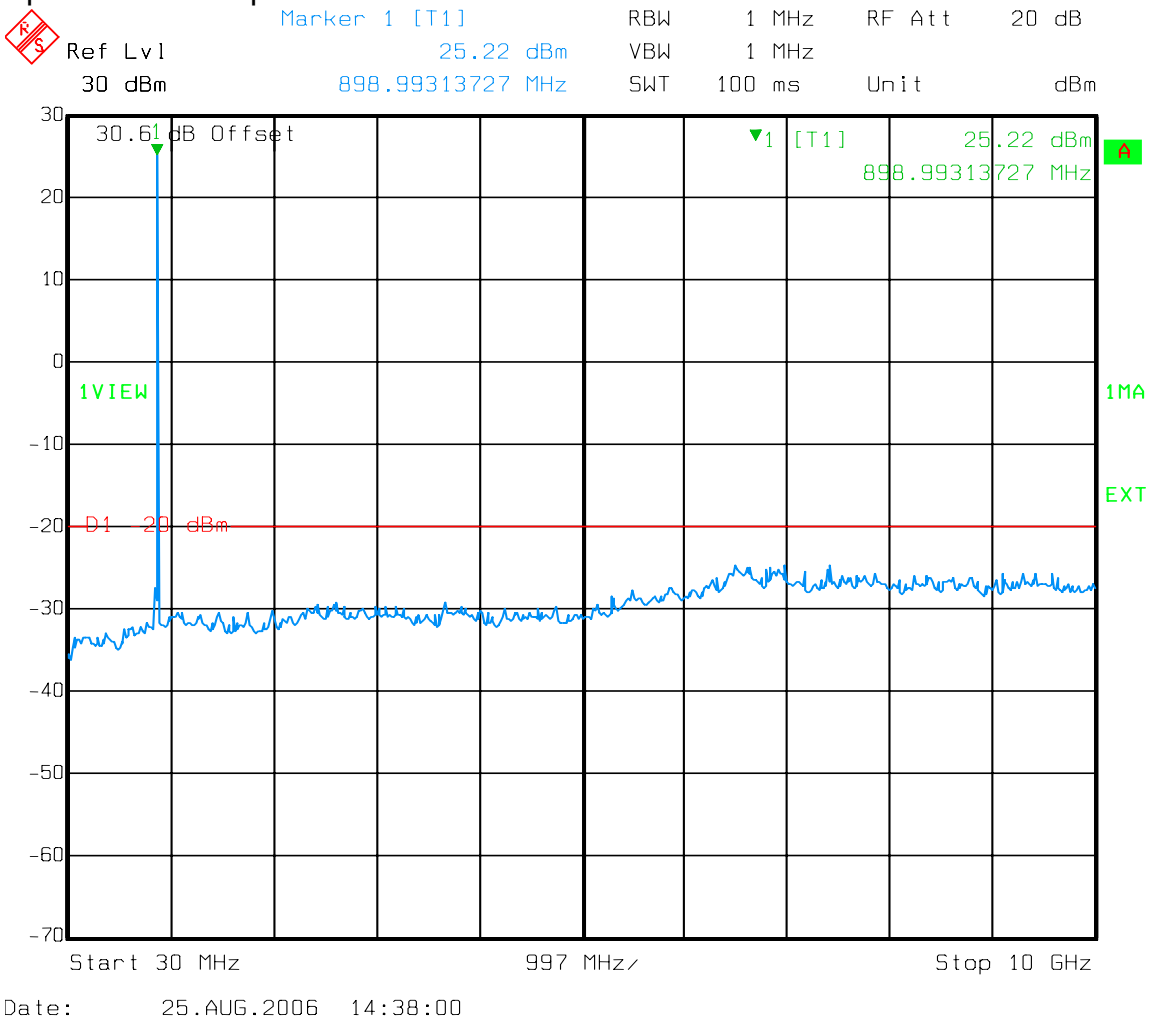
Test Data – Spurious Emissions at Antenna Terminals

Spurs – iDEN - Downlink



Test Data – Spurious Emissions at Antenna Terminals

Spurs – iDEN - Uplink



Section 6. Field Strength of Spurious Emissions

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.1053
TESTED BY: David Light	DATE: 31 August 2006

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.

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Equipment Used: 1484-1485-1464-1016-791-1306-759

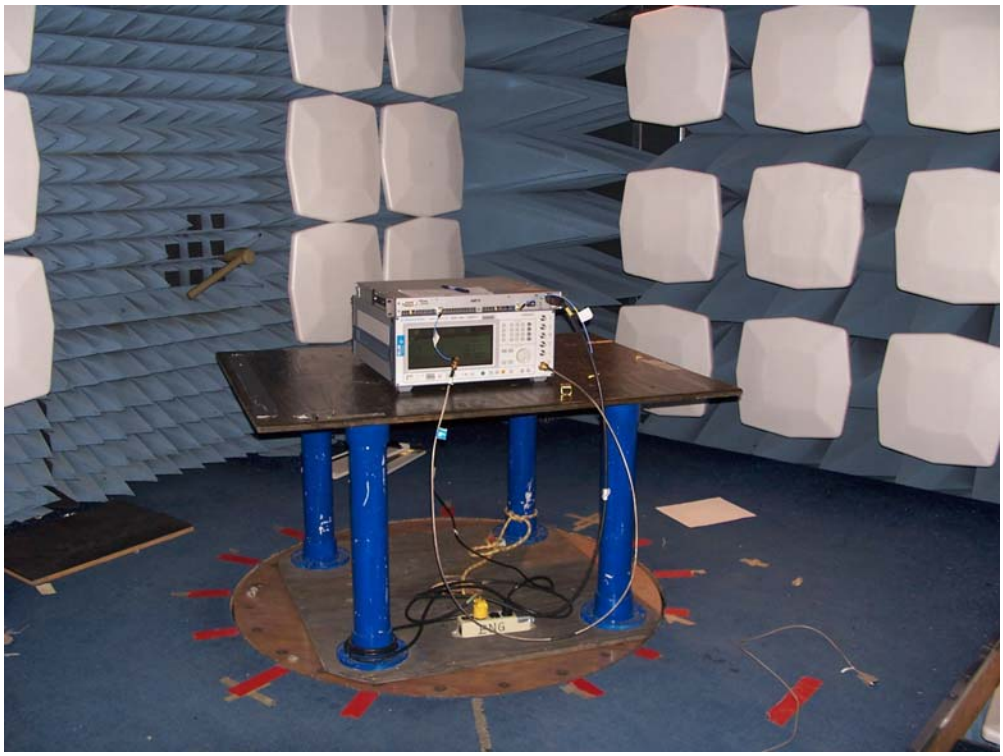
Measurement Uncertainty: +/-1.7 dB

Temperature: 23 °C

Relative Humidity: 40 %

Note: See page A5 for applicable limit.

Photographs of Test Setup



Section 7. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1082	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	CBU	N/A
1469	10 db Attenuator DC 18 Ghz	MCL Inc. BW-S10W2 10db-2WDC	NONE	CBU	N/A
1472	20db Attenuator DC 18 Ghz	Omni Spectra 20600-20db	NONE	CBU	N/A
1659	Spectrum Analyzer	Rhode & Schwarz FSP	973353	01/10/06	01/10/07
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	05/26/06	05/26/08
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/14/05	01/15/07
1484	Cable	Storm PR90-010-072	N/A	08/26/05	08/26/06
1485	Cable	Storm PR90-010-216	N/A	08/26/05	08/26/06
791	PREAMP, 25dB	Nemko USA, Inc. LNA25	398	04/20/06	04/20/07
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	04/20/06	04/20/07
759	ANTENNA, LOG PERIODIC	A.H. SYSTEMS SAS-200/510	556	02/13/06	02/13/07
1306	Antenna biconical	Nemko USA, Inc. BCON 30300	212	02/10/06	02/10/07

ANNEX A - TEST METHODOLOGIES

NAME OF TEST: RF Power Output **PARA. NO.: 2.1046**

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: RF Power Output	**PARA. NO.: 2.1046**

Minimum Standard: 24.132 Power and antenna height limits.

(a) Stations transmitting in the 901-902 MHz band are limited to 7 watts e.r.p.

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.: 2.1051**

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 dBμV/m@3m	82.2 dBμV/m@3m
D,J	-20dBm	77.4 dBμV/m@3m	75.2 dBμV/m@3m
E,F,K	-25dBm	72.4 dBμV/m@3m	70.2 dBμV/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: Spurious Emissions at Antenna Terminals **PARA. NO.: 2.1051**

Minimum Standard: 24.133 Emission limits.

(a) The power of any emission shall be attenuated below the transmitter power (P), as measured in accordance with §24.132(f), in accordance with the following schedule:

(1) For transmitters authorized a bandwidth greater than 10 kHz:

(i) On any frequency outside the authorized bandwidth and removed from the edge of the authorized bandwidth by a displacement frequency (f_d in kHz) of up to and including 40 kHz: at least 116 Log_{10} ((f_d + 10)/6.1) decibels or 50 plus 10 Log_{10} (P) decibels or 70 decibels, whichever is the lesser attenuation;

(ii) On any frequency outside the authorized bandwidth and removed from the edge of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 40 kHz: at least 43 + 10 Log_{10} (P) decibels or 80 decibels, whichever is the lesser attenuation.

(2) For transmitters authorized a bandwidth of 10 kHz:

(i) On any frequency outside the authorized bandwidth and removed from the edge of the authorized bandwidth by a displacement frequency (f_d in kHz) of up to and including 20 kHz: at least 116 x Log_{10} ((f_d + 5)/3.05) decibels or 50 + 10 x Log_{10} (P) decibels or 70 decibels, whichever is the lesser attenuation;

(ii) On any frequency outside the authorized bandwidth and removed from the edge of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 20 kHz: at least 43 + 10 Log_{10} (P) decibels or 80 decibels, whichever is the lesser attenuation.

(b) The measurements of emission power can be expressed in peak or average values provided they are expressed in the same parameters as the transmitter power.

(c) When an emission outside of the authorized bandwidth causes harmful Interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

(d) A minimum spectrum analyzer resolution bandwidth of 300 Hz shall be used when showing compliance with paragraphs (a)(1)(i) & (ii) and (a)(2)(i) & (ii).

NAME OF TEST: Occupied Bandwidth **PARA. NO.: 2.1049**

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.: 2.1051**

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 dBμV/m@3m	82.2 dBμV/m@3m
D,J	-20dBm	77.4 dBμV/m@3m	75.2 dBμV/m@3m
E,F,K	-25dBm	72.4 dBμV/m@3m	70.2 dBμV/m@3m

NAME OF TEST: Frequency Stability **PARA. NO.: 2.1055**

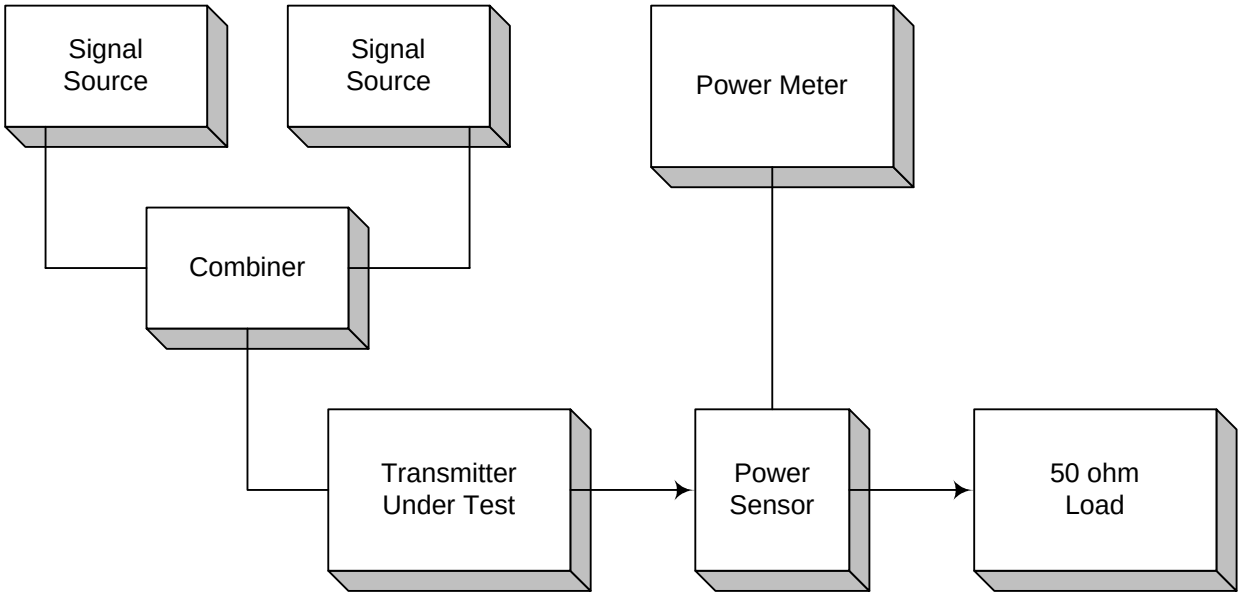
Minimum Standard: Para. No. 990.213. The transmitter carrier frequency shall remain within the assigned frequency below in ppm.

Table 2

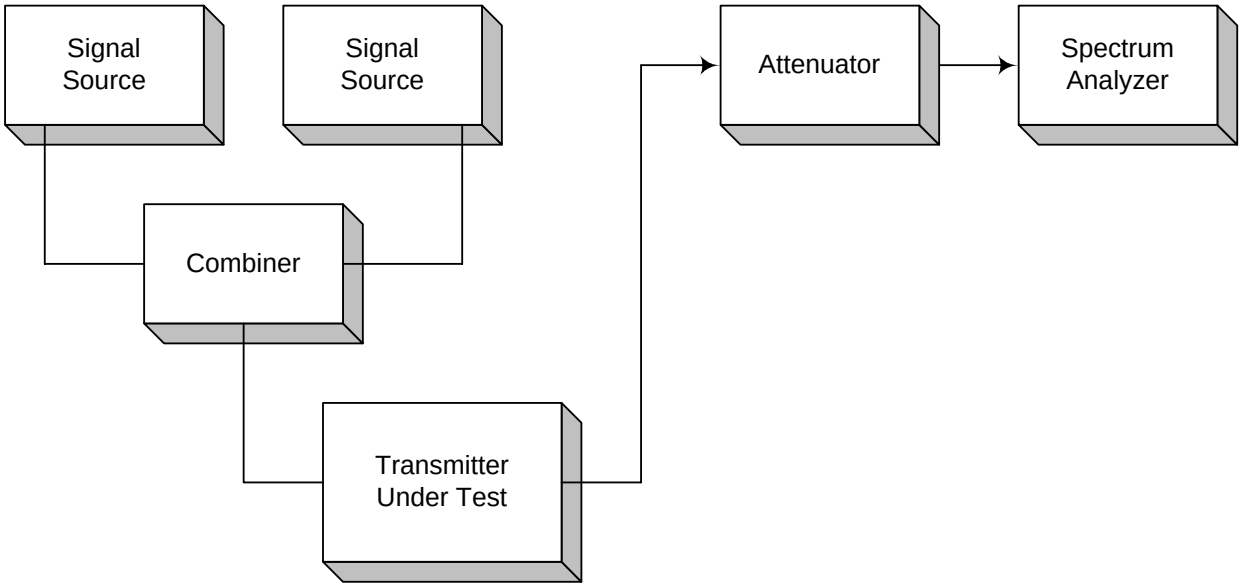
Frequency Band (MHz)	Fixed And Base Stations	Mobile Stations	
		> 2 Watts o/p pwr	< 2 Watts o/p pwr
Below 25	100	100	200
25 - 50	20	20	50
72 - 76	5	-	50
150 - 174	5	5	5
220 - 222	0.1	1.5	1.5
421 - 512	2.5	5	5
806 - 821	1.5	2.5	2.5
821 - 824	1.0	1.5	15
851 - 866	1.5	2.5	2.5
866 - 869	1.0	1.5	1.5
869 -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

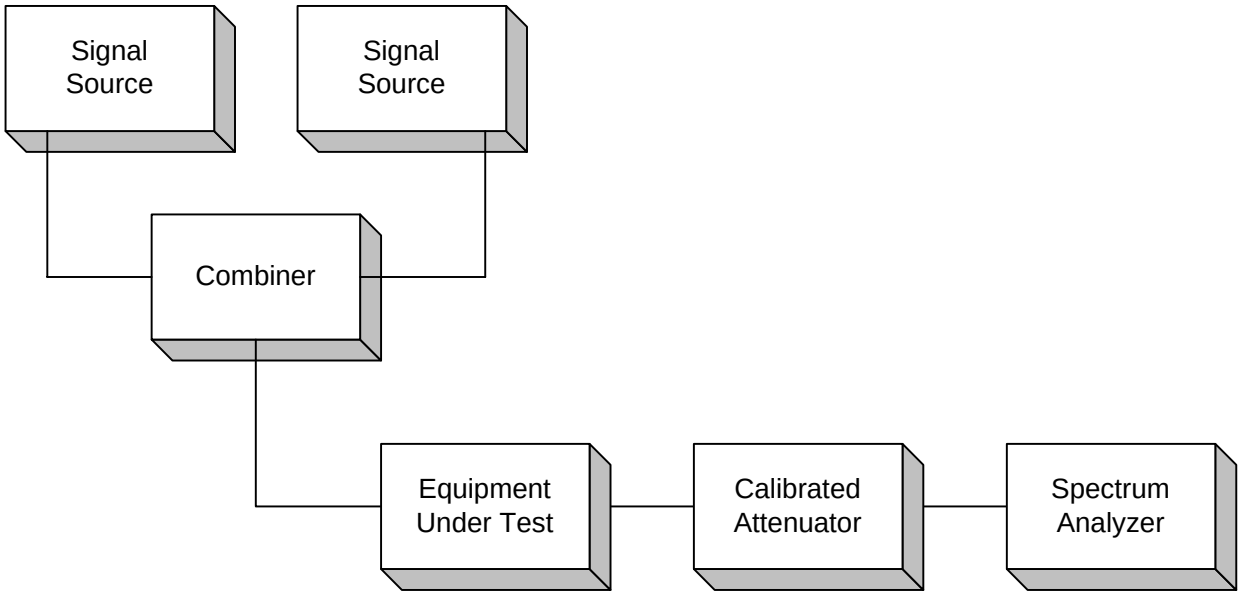
Para. No. 2.1046 - R.F. Power Output



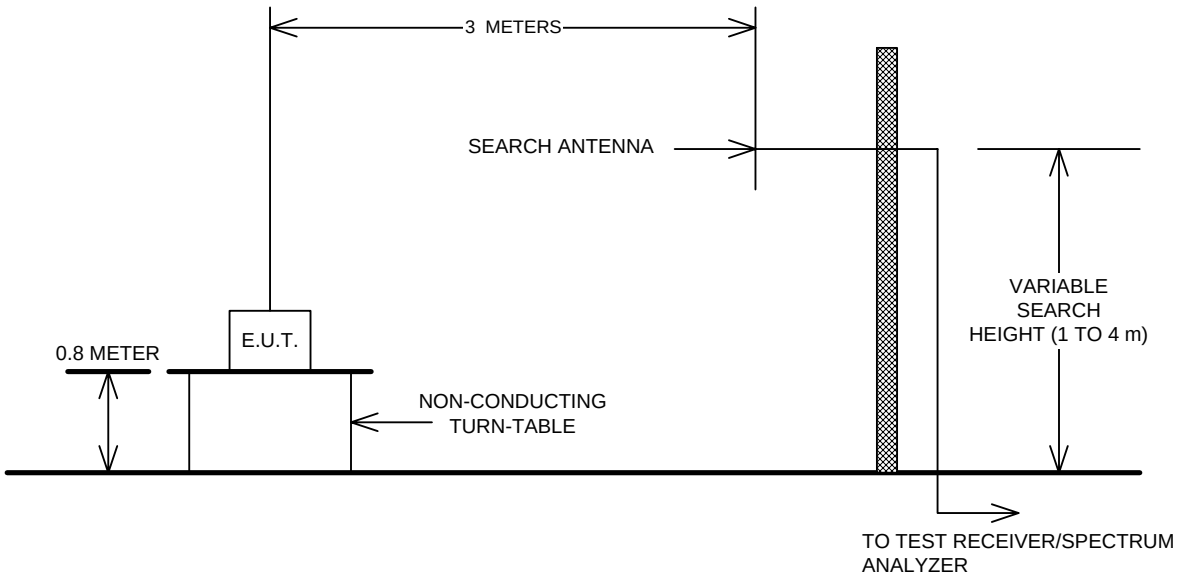
Para. No. 2.1049 - Occupied Bandwidth



Para. No. 21051 - Spurious Emissions at Antenna Terminals



Para. No. 2.1053 - Field Strength of Spurious Radiation



Para. No. 2.1055 Frequency Stability