

**Nemko Test Report:** 6L0003RUS1

**Applicant:** Andrew Corporation

**Equipment Under Test:** MR803D  
(E.U.T.)

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

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

**Authorized By:**   
Kevin Rose  
Wireless Engineer

**Date:** February 8, 2006

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*EQUIPMENT:*    **MR803D**PROJECT NO.:    **6L0003RUS1**

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**Section 1.            Summary of Test Results**

Manufacturer:            Andrew Corporation

Model No.:              MR803D

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 FCC 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	100W	Complies
Occupied Bandwidth	90.210	Input/Output	Complies
Spurious Emissions at Antenna Terminals	90.210	-13 to -20 dBm	Complies
Field Strength of Spurious Emissions	90.210	-13 to -20 dBm	Complies
Frequency Stability	90.213	N/A	N/A
Transient Frequency Behavior	90.214	N/A	N/A
Out of Band Rejection	NA	None	

**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. does not translate frequency, Frequency stability was nor performed.
  - (4) Input level was adjusted for maximum RF input level for all tests.
- .

*EQUIPMENT:* MR803DPROJECT NO.: 6L0003RUS1

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**Section 2. General Equipment Specification****Transmitter****Supply Voltage Input:** 120 Vac**Frequency Range:** 806.0125 to 823.9875 MHz Uplink  
851.0125 to 868.9875 MHz Downlink**Tunable Bands:****20 dB Passband:**

<b>Type(s) of Modulation:</b>	<b>F3E/ F1D</b> (Analog)	<b>GXW</b> (iDEN)
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

**Gain:** 60**Output Impedance:** 50 ohms

RF Power Output (rated):	Output Power per Carrier, dBm			
Technology	1	2	4	8
Analog	18	15	12	9
iDEN	16	13	10	7

**Channel Spacing(s):** 12.5 kHz**Operator Selection of Operating Frequency:** None

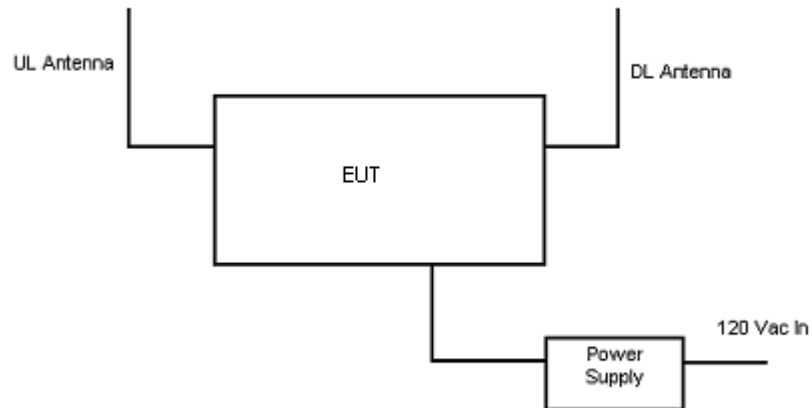
<b>Frequency Translation:</b>	<b>F1-F1</b>	<b>F1-F2</b>	<b>N/A</b>
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<b>Band Selection:</b>	<b>Software</b>	<b>Duplexer Change</b>	<b>Fullband Coverage</b>
	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

## Theory of Operation

The MR803D band selective mini repeater is a bi-directional amplifier used to enhance signals between a mobile and base station in a wireless network.

## System Diagram



EQUIPMENT: MR803D

PROJECT NO.: 6L0003RUS1

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**Section 3. RF Power Output**

NAME OF TEST: RF Power Output	PARA. NO.: 90.635
TESTED BY: David Light	DATE: 08 February 2006

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

Frequency (MHz)	Measured Power (dBm)	Rated Power (dBm)	Technology
806.0125	+18.14	+18	Analog
815	+18.09	+18	Analog
823.9875	+18.20	+18	Analog
806.0125	+16.08	+16	iDEN
815	+16.02	+16	iDEN
823.9875	+16.06	+16	iDEN
851.0125	+18.04	+18	Analog
860	+18.07	+18	Analog
868.9875	+18.0	+18	Analog
851.0125	+16.18	+16	iDEN
860	+16.03	+16	iDEN
868.9875	+16.1	+16	iDEN

**Equipment Used:** 1036-1472-1626-1053-1052-1081**Measurement Uncertainty:**  $\pm 1.7 \text{ dB}$  dB  
 $1 \times 10^{-7}$  ppm**Temperature:** 22 °C**Relative Humidity:** 45 %

## Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 90.210
TESTED BY: David Light	DATE: 08 February 2006

**Test Results:** Complies.

**Test Data:** See attached graph(s).

**Equipment Used:** 1036-1472-1626-1053-1052-1081

**Measurement Uncertainty:** +/- 1.7 dB dB  
1x10<sup>-7</sup> ppm

**Temperature:** 22 °C

**Relative Humidity:** 45 %

Note: Analog test were performed using a 2.5 kHz tone with 3 kHz peak deviation.



EQUIPMENT: MR803D

PROJECT NO.: 6L0003RUS1

# Test Data – Occupied Bandwidth

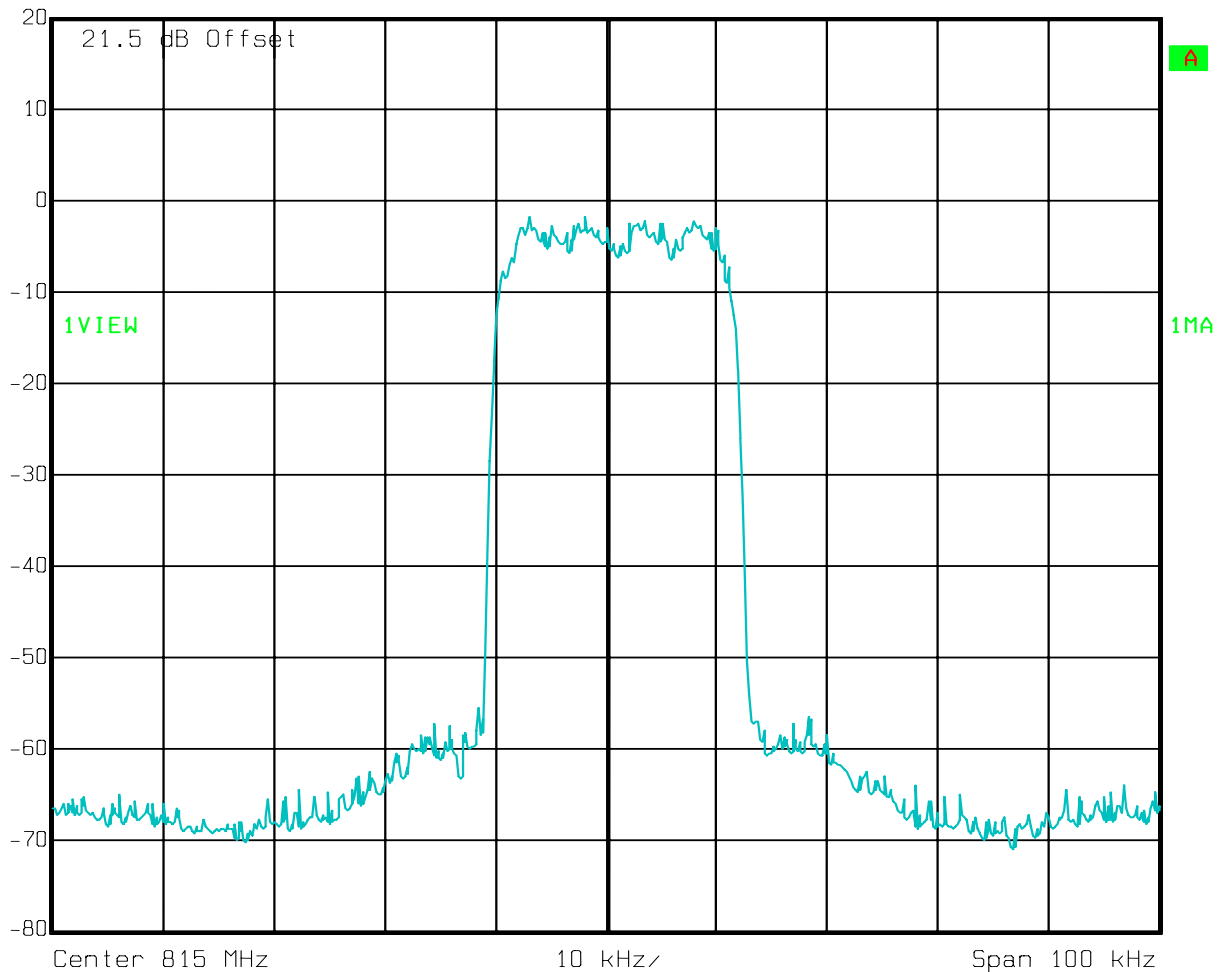
Uplink - Output

iDEN



Ref Lvl  
20 dBm

RBW	300 Hz	RF Att	20 dB
VBW	300 Hz		
SWT	5.6 s	Unit	dBm



Date: 08.FEB.2006 14:13:14

EQUIPMENT: MR803D

PROJECT NO.: 6L0003RUS1

# Test Data – Occupied Bandwidth

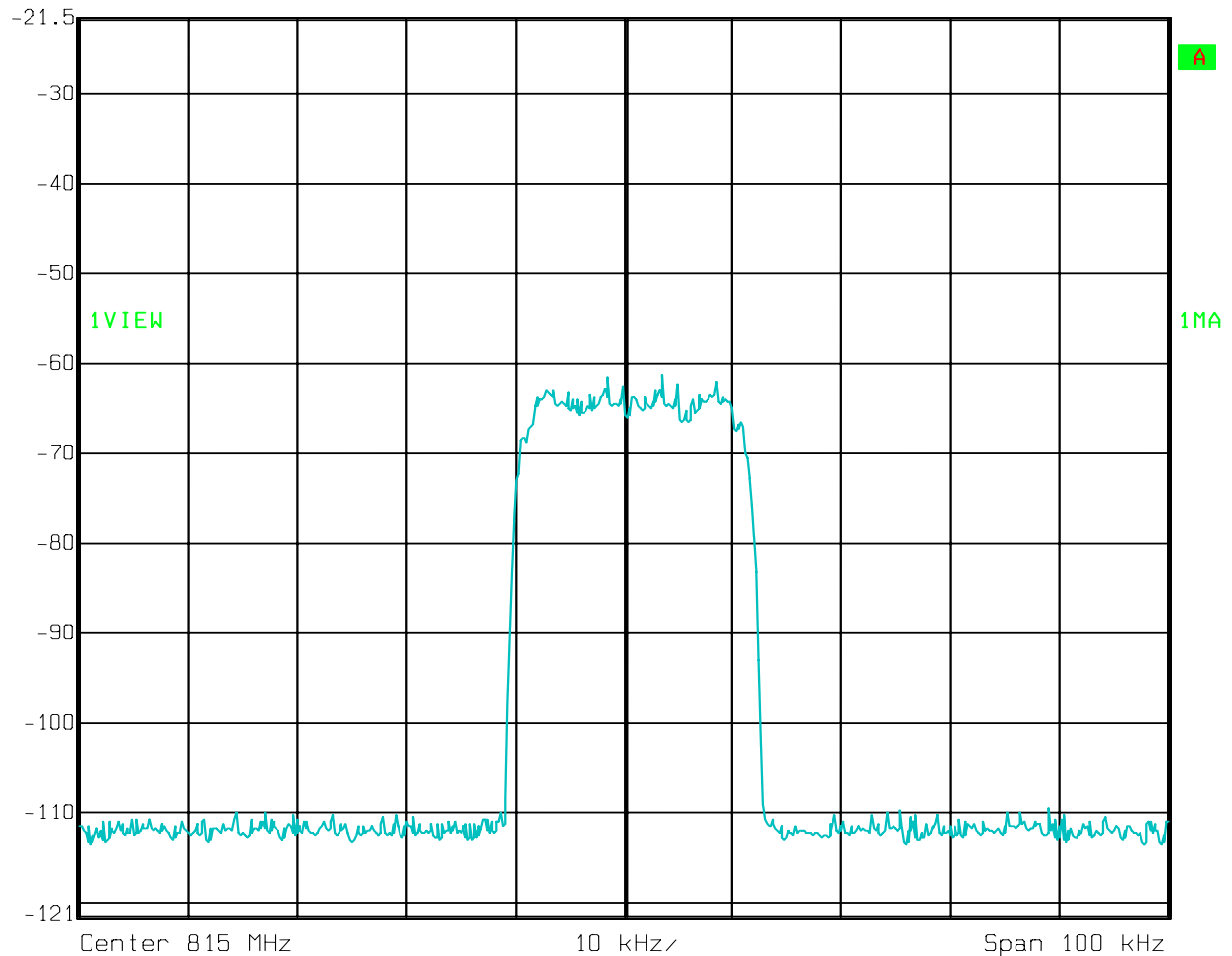
Uplink - Input

iDEN



Ref Lvl  
-21.5 dBm

RBW	300 Hz	RF Att	10 dB
VBW	300 Hz		
SWT	5.6 s	Unit	dBm



Date: 08.FEB.2006 14:15:13

# Test Data – Occupied Bandwidth

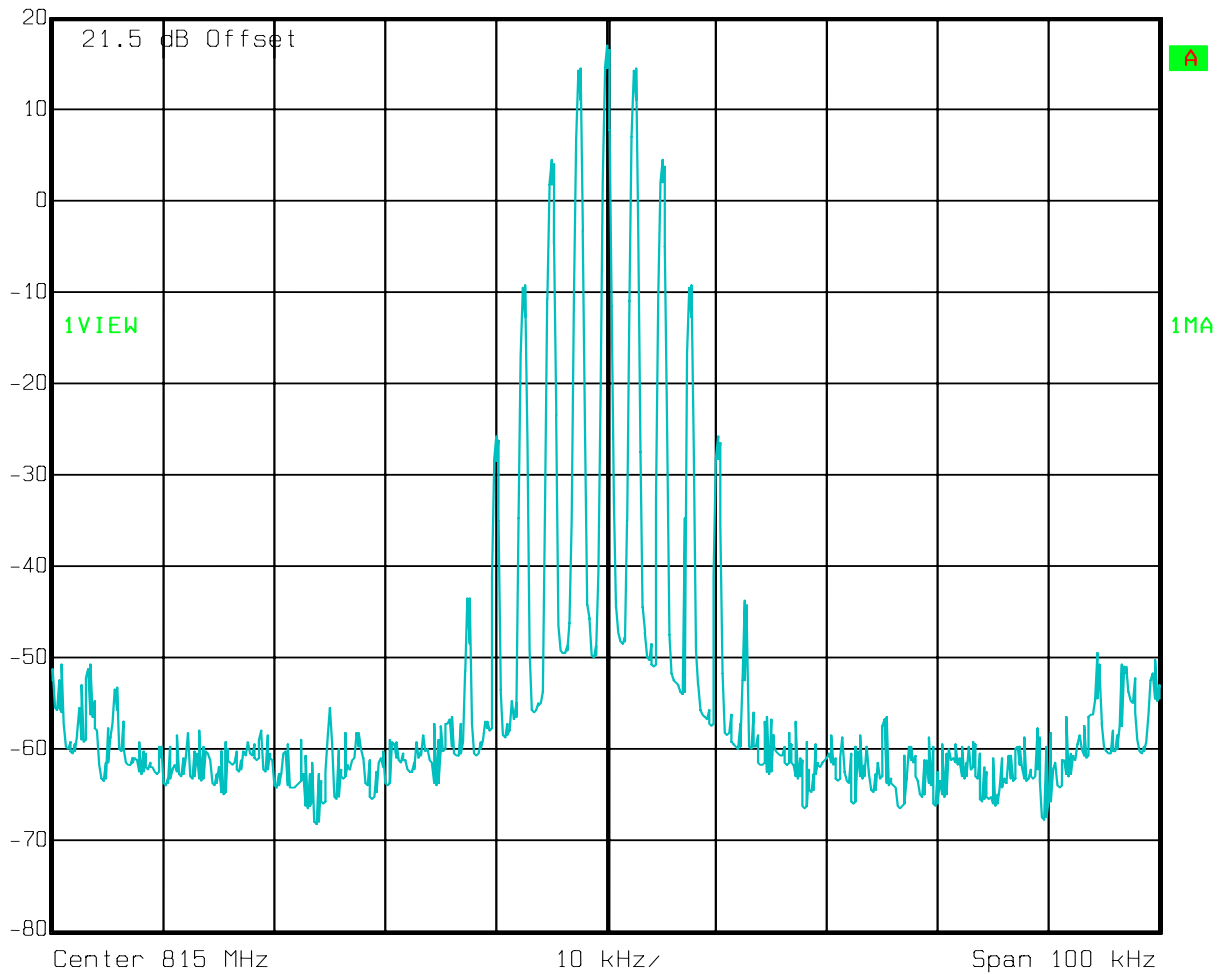
Uplink - Output

Analog



Ref Lvl  
20 dBm

RBW	300 Hz	RF Att	20 dB
VBW	300 Hz		
SWT	5.6 s	Unit	dBm



Date: 08.FEB.2006 14:52:26

EQUIPMENT: MR803D

PROJECT NO.: 6L0003RUS1

### Test Data – Occupied Bandwidth

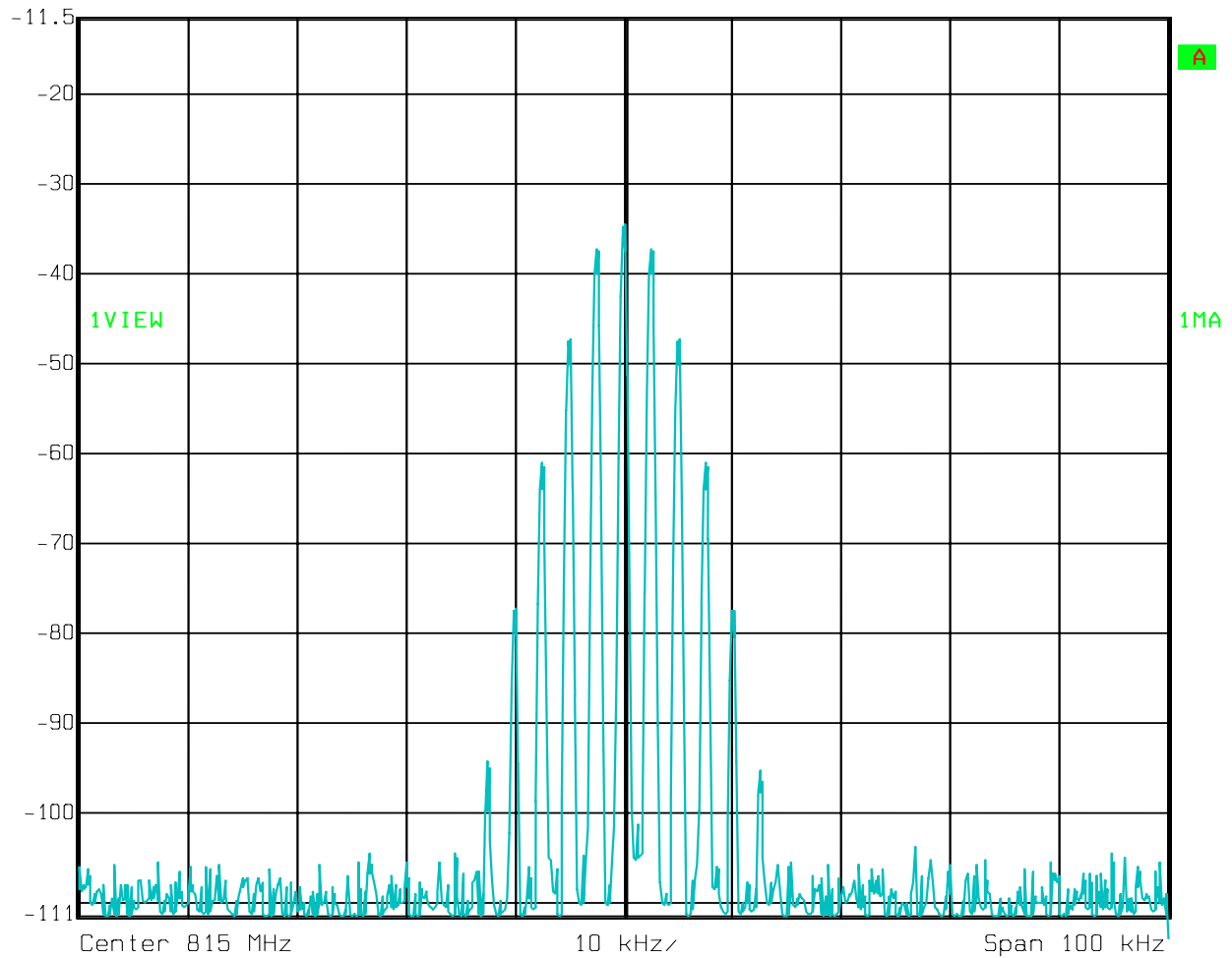
Uplink - Input

Analog



Ref Lvl  
-11.5 dBm

RBW	300 Hz	RF Att	10 dB
VBW	300 Hz		
SWT	5.6 s	Unit	dBm



Date: 08.FEB.2006 14:54:47

EQUIPMENT: MR803D

PROJECT NO.: 6L0003RUS1

# Test Data – Occupied Bandwidth

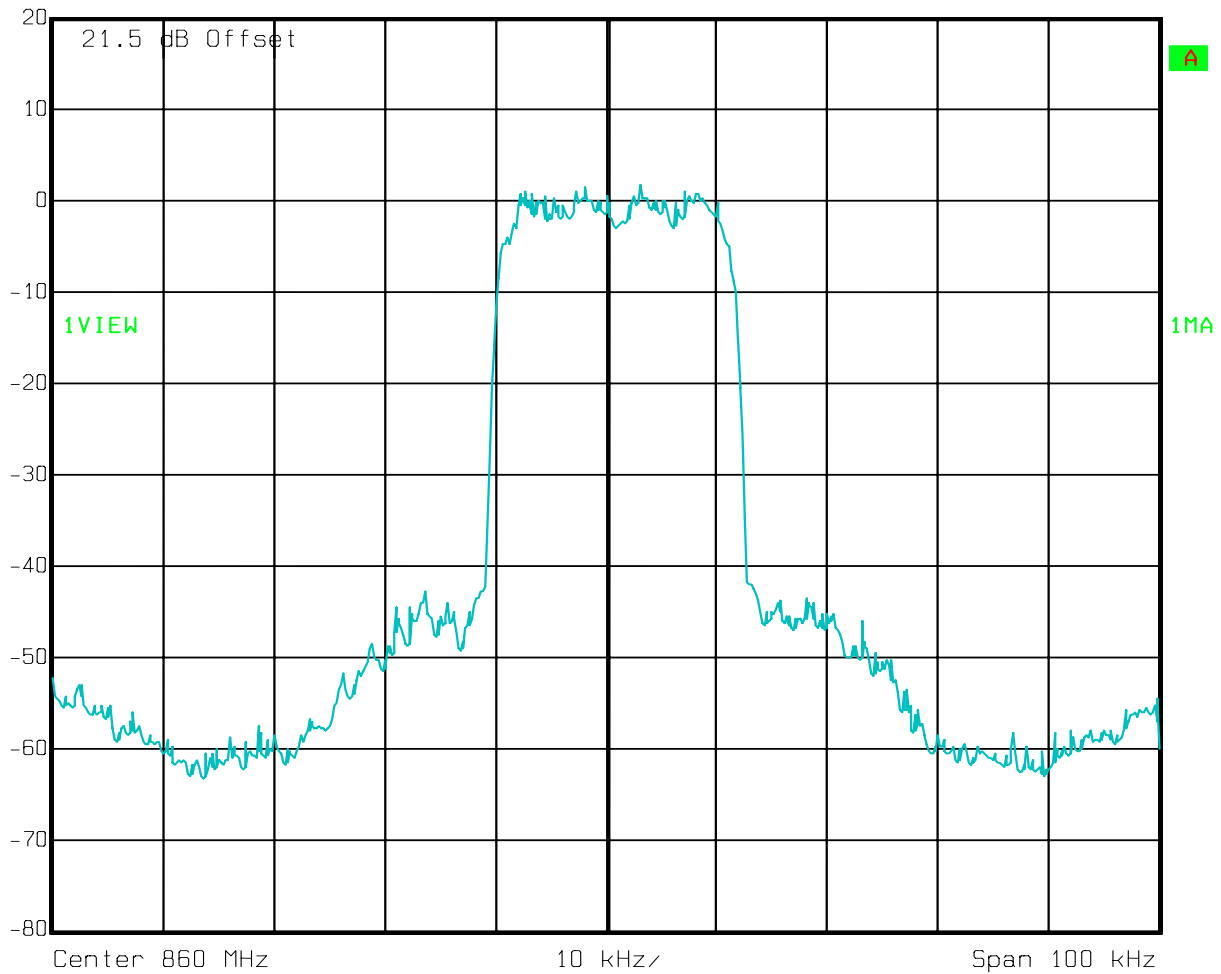
Downlink - Output

iDEN



Ref Lvl  
20 dBm

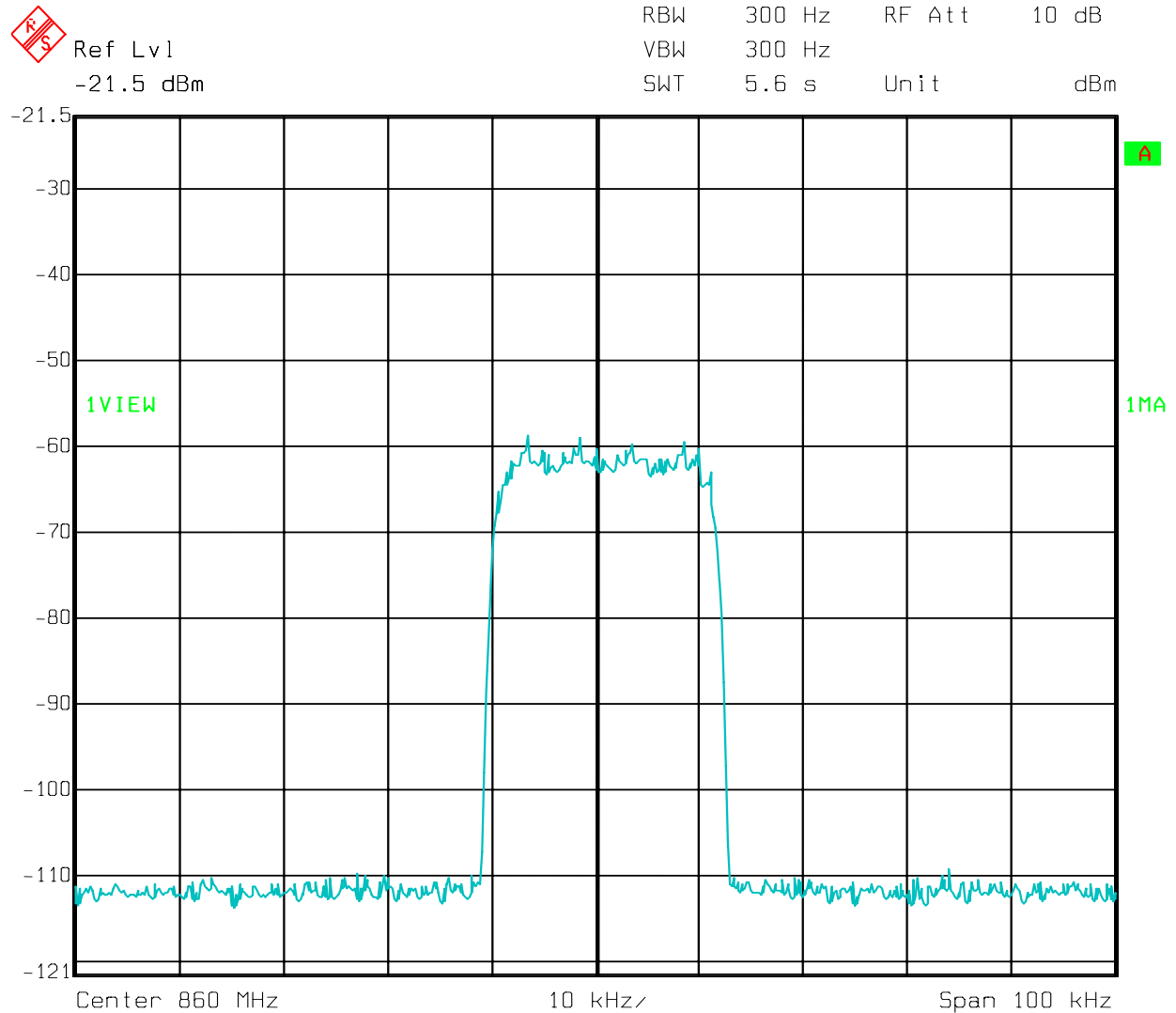
RBW	300 Hz	RF Att	20 dB
VBW	300 Hz		
SWT	5.6 s	Unit	dBm



Date: 08.FEB.2006 13:52:21

# Test Data – Occupied Bandwidth

Downlink - Input  
iDEN



Date: 08.FEB.2006 13:54:38

EQUIPMENT: MR803D

PROJECT NO.: 6L0003RUS1

# Test Data – Occupied Bandwidth

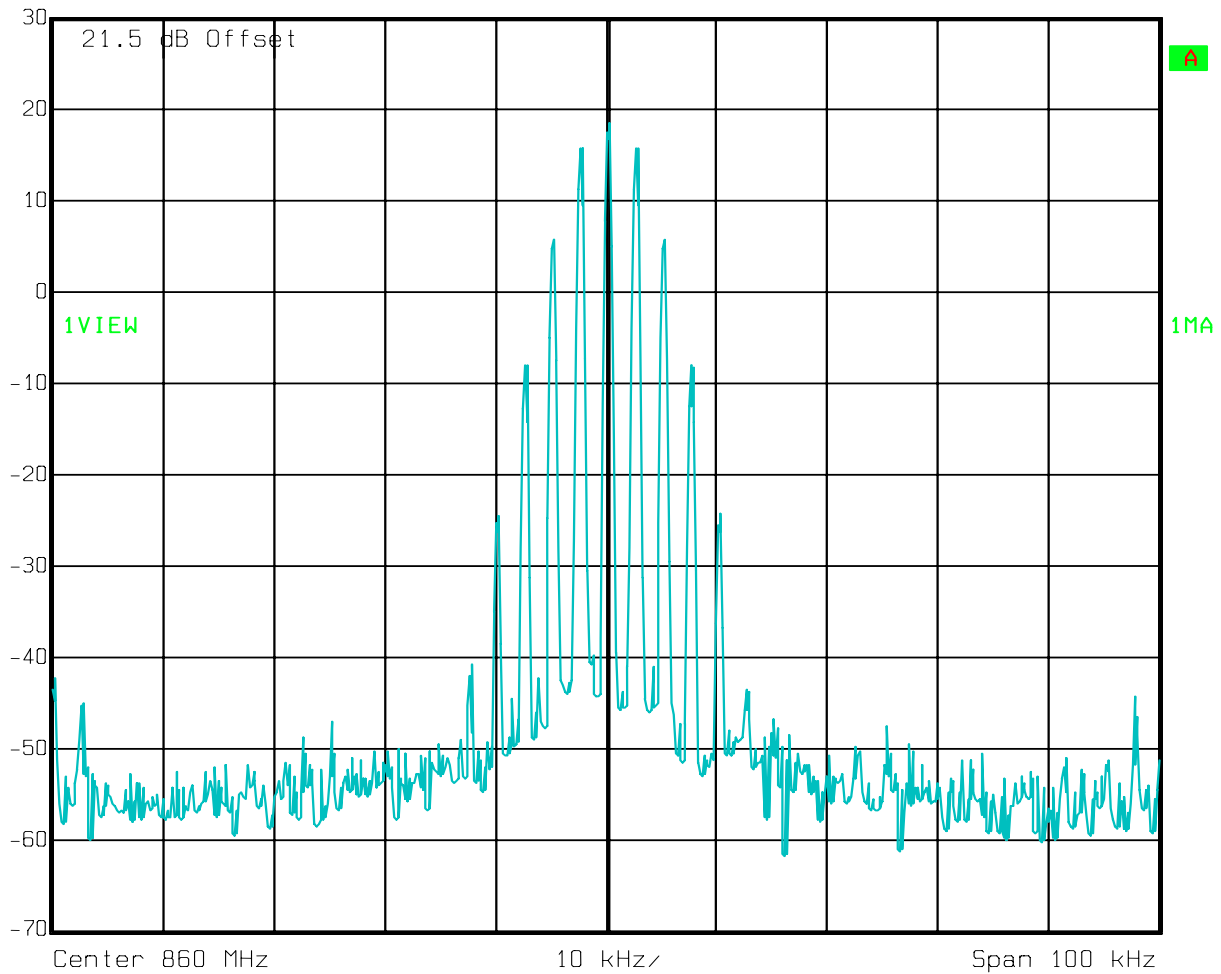
Downlink - Output

Analog



Ref Lvl  
30 dBm

RBW	300 Hz	RF Att	30 dB
VBW	300 Hz		
SWT	5.6 s	Unit	dBm



Date: 08.FEB.2006 14:58:44

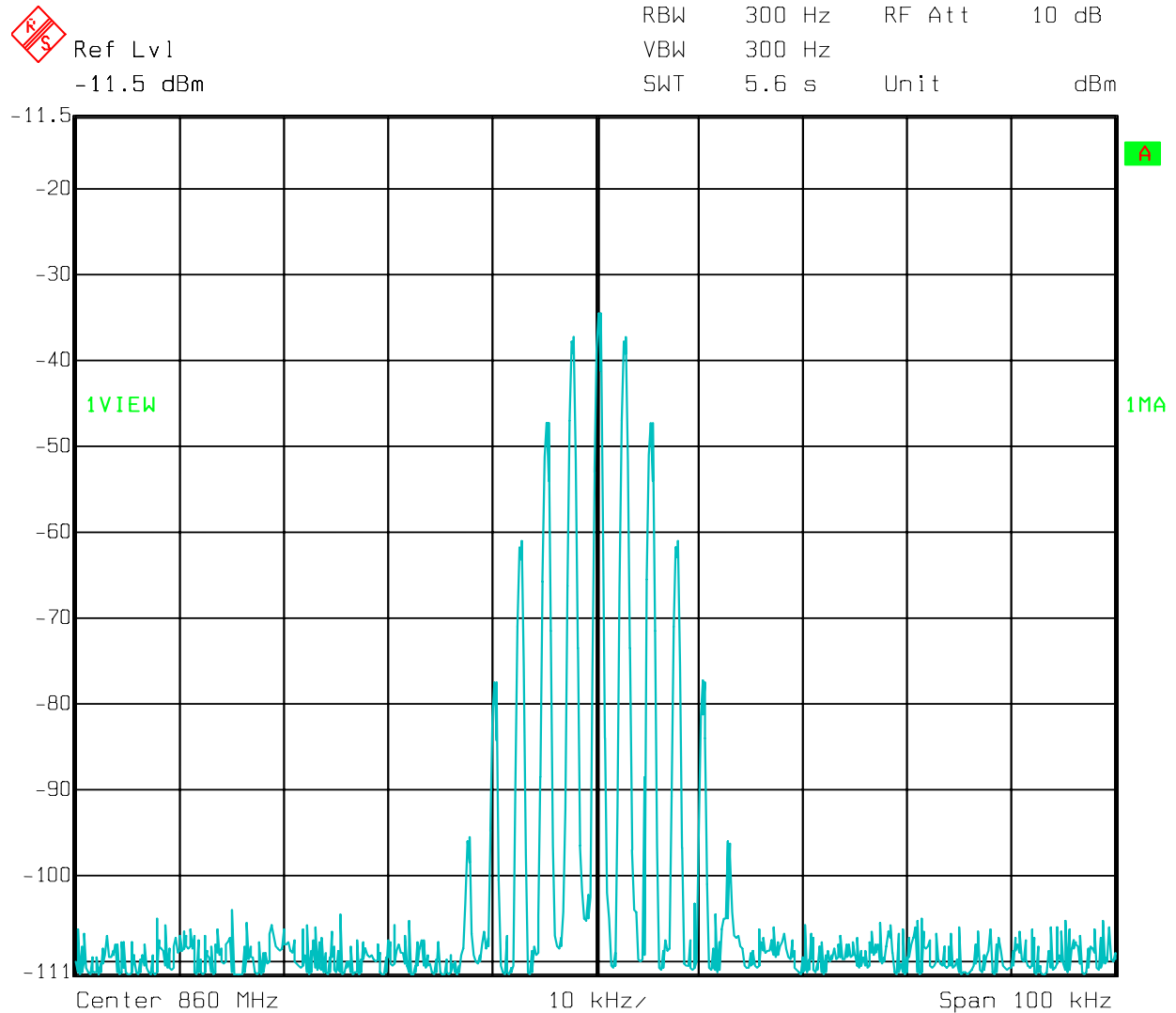
EQUIPMENT: MR803D

PROJECT NO.: 6L0003RUS1

# Test Data – Occupied Bandwidth

Downlink - Input

Analog



Date: 08.FEB.2006 14:56:46



## **Section 5.            Spurious Emissions at Antenna Terminals**

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 90.210
TESTED BY: David Light	DATE: 08 February 2006

**Test Results:**                      Complies.

**Test Data:**                        See attached graph(s).

**Equipment Used:**    1036-1472-1626-1053-1052-1081

**Measurement Uncertainty:**        +/- 1.7    dB

**Temperature:**                      22    °C

**Relative Humidity:**                45    %

EQUIPMENT: MR803D

PROJECT NO.: 6L0003RUS1

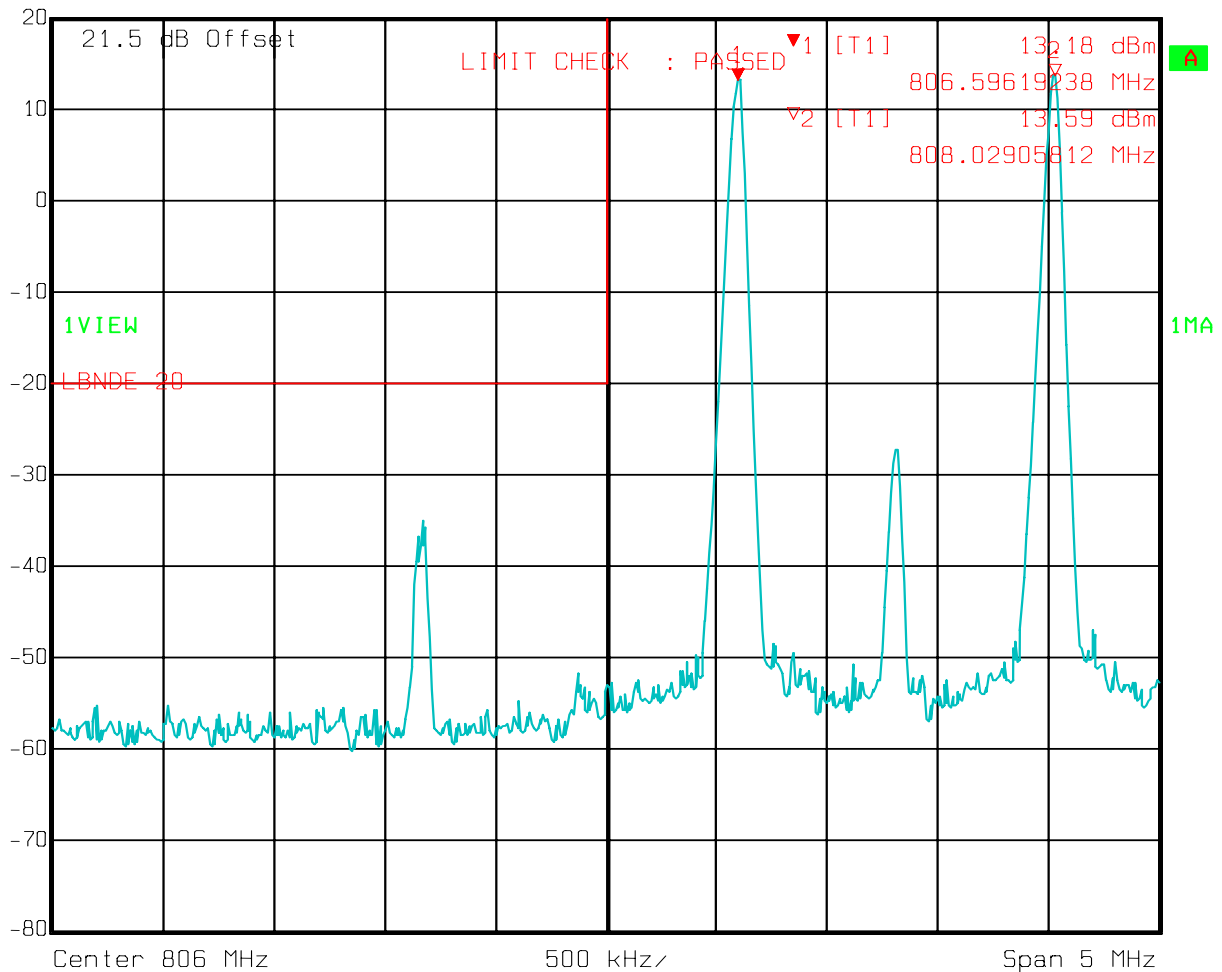
## Test Data – Spurious Emissions at Antenna Terminals

Uplink

iDEN



Marker 1 [T1] RBW 30 kHz RF Att 20 dB  
Ref Lvl 13.18 dBm VBW 30 kHz  
20 dBm 806.59619238 MHz SWT 14 ms Unit dBm

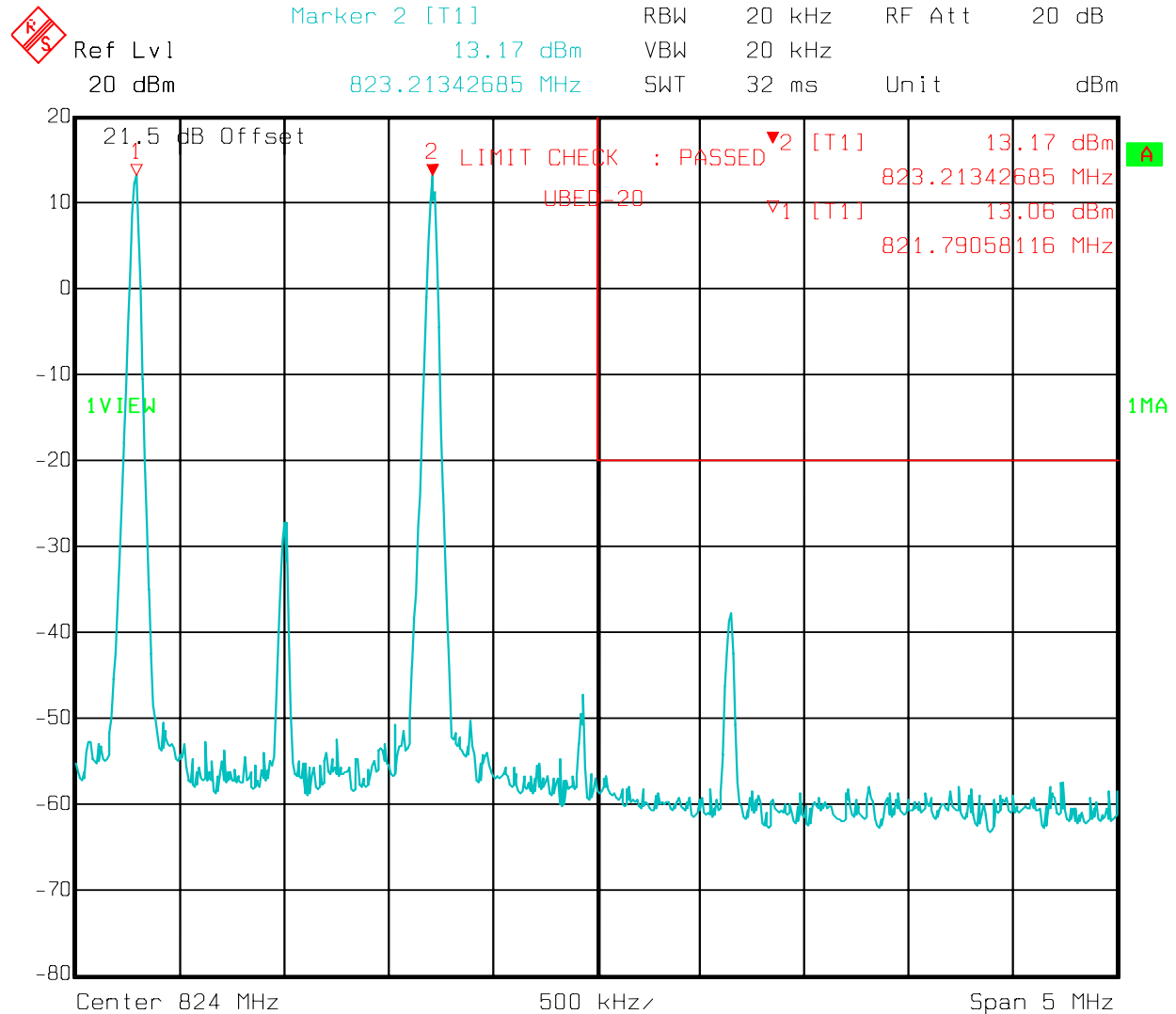


Date: 08.FEB.2006 14:27:16

## Test Data – Spurious Emissions at Antenna Terminals

Uplink

iDEN



Date: 08.FEB.2006 14:29:51

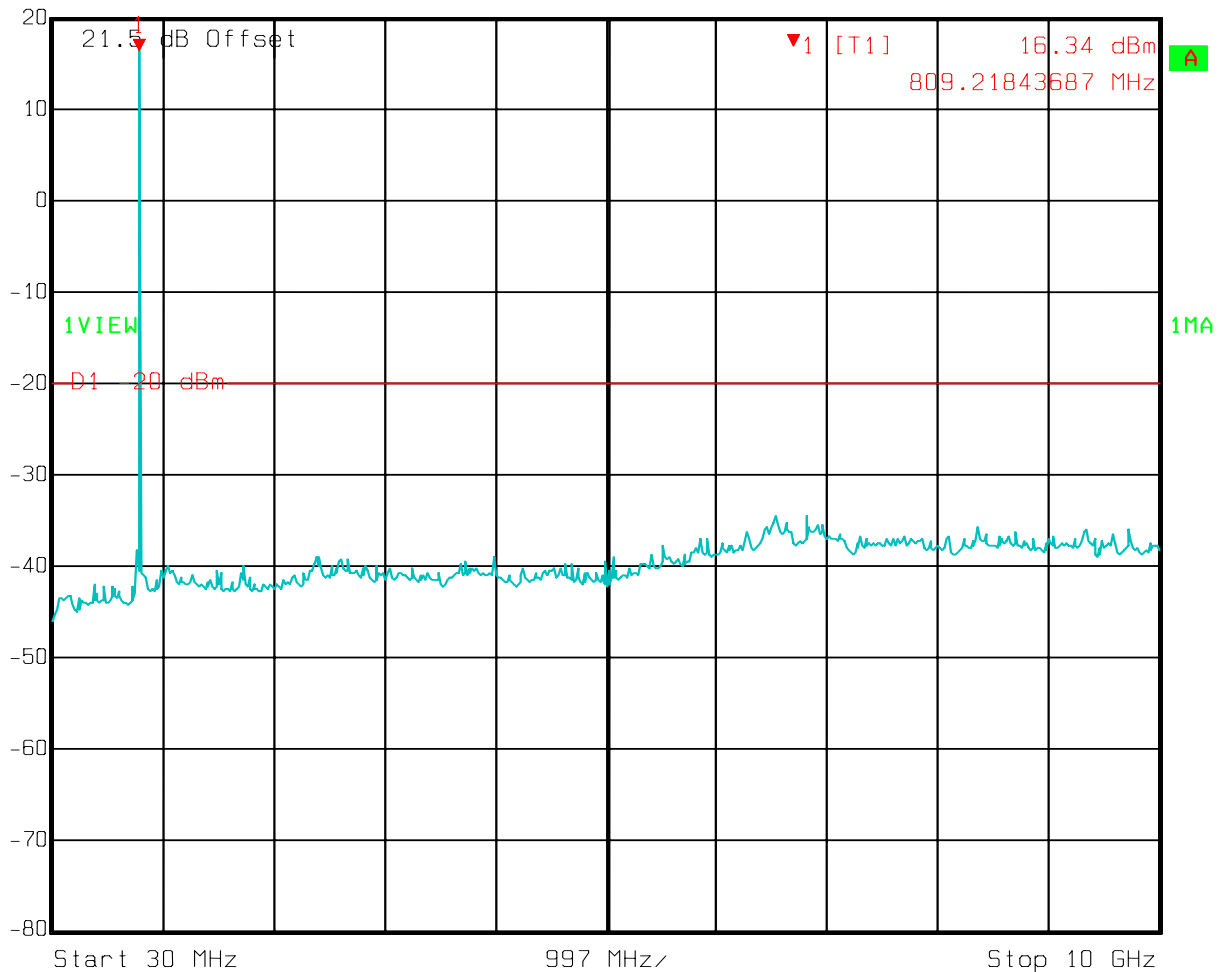
# Test Data – Spurious Emissions at Antenna Terminals

Uplink

iDEN



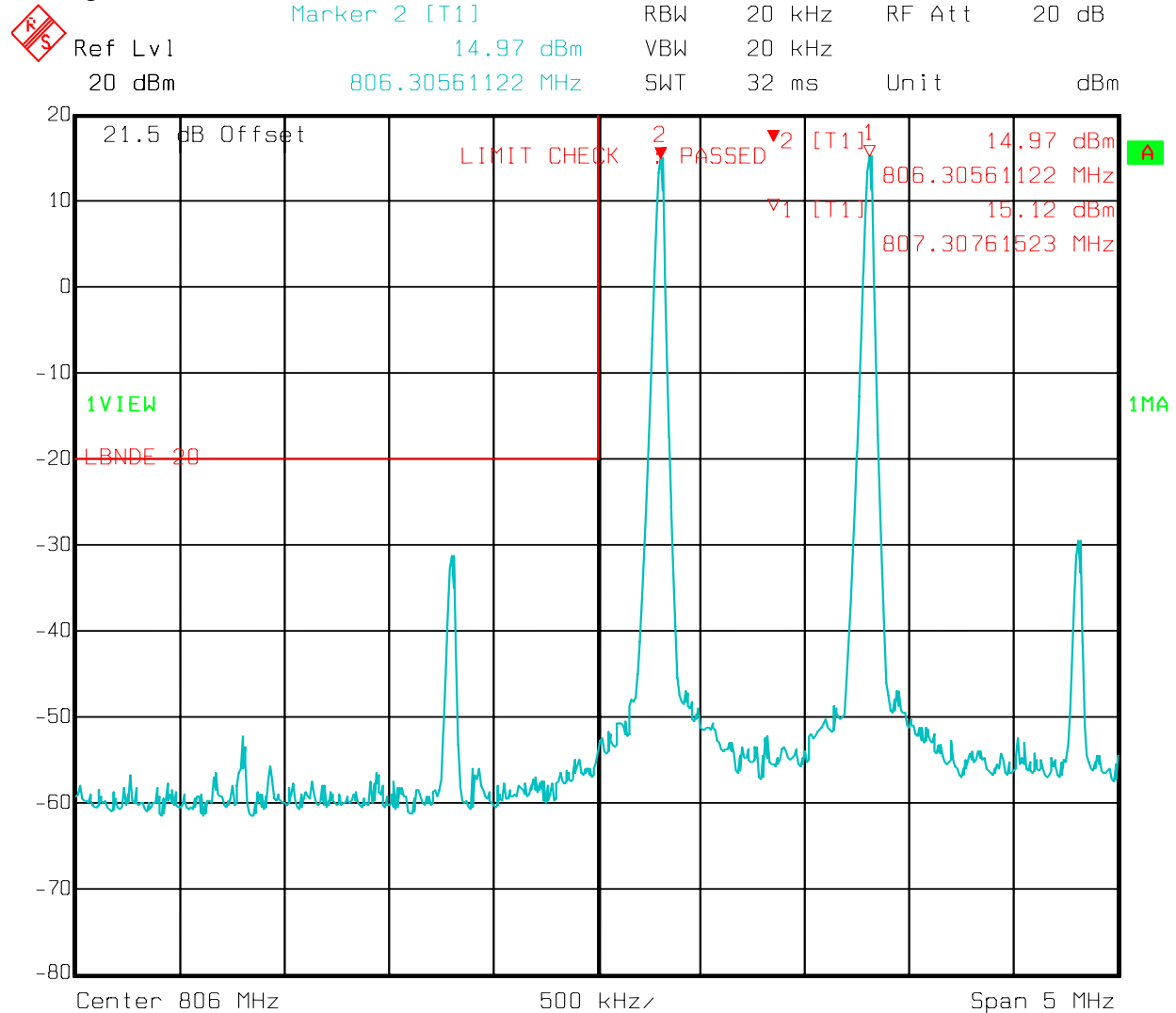
Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
16.34 dBm VBW 1 MHz  
809.21843687 MHz SWT 100 ms Unit dBm



Date: 08.FEB.2006 14:17:09

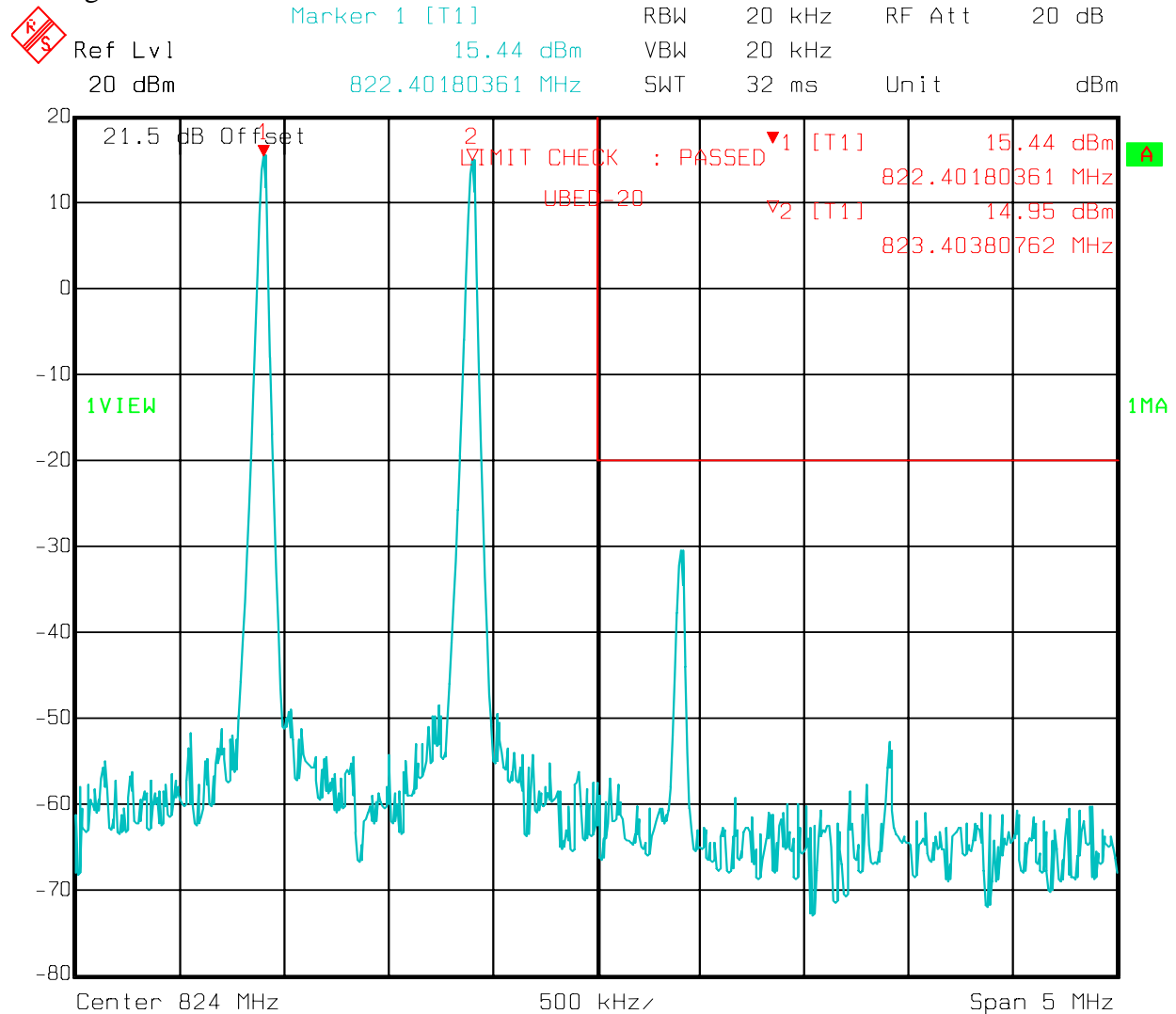
Test Data – Spurious Emissions at Antenna Terminals

Uplink  
Analog



Date: 08.FEB.2006 14:23:45

## Test Data – Spurious Emissions at Antenna Terminals

Uplink  
Analog

Date: 08.FEB.2006 14:22:07

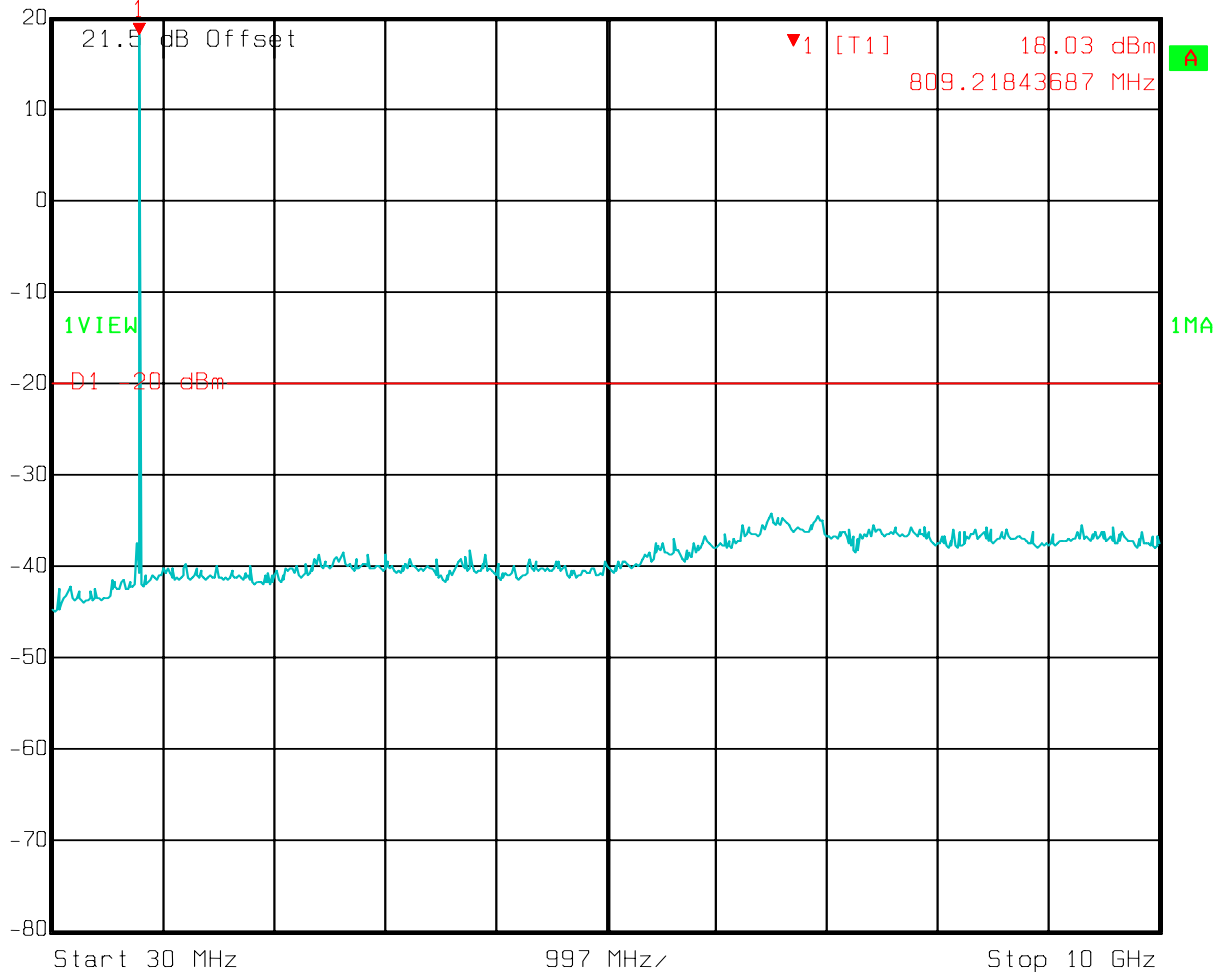
# Test Data – Spurious Emissions at Antenna Terminals

Uplink

Analog



Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
18.03 dBm VBW 1 MHz  
809.21843687 MHz SWT 100 ms Unit dBm



Date: 08.FEB.2006 14:18:13

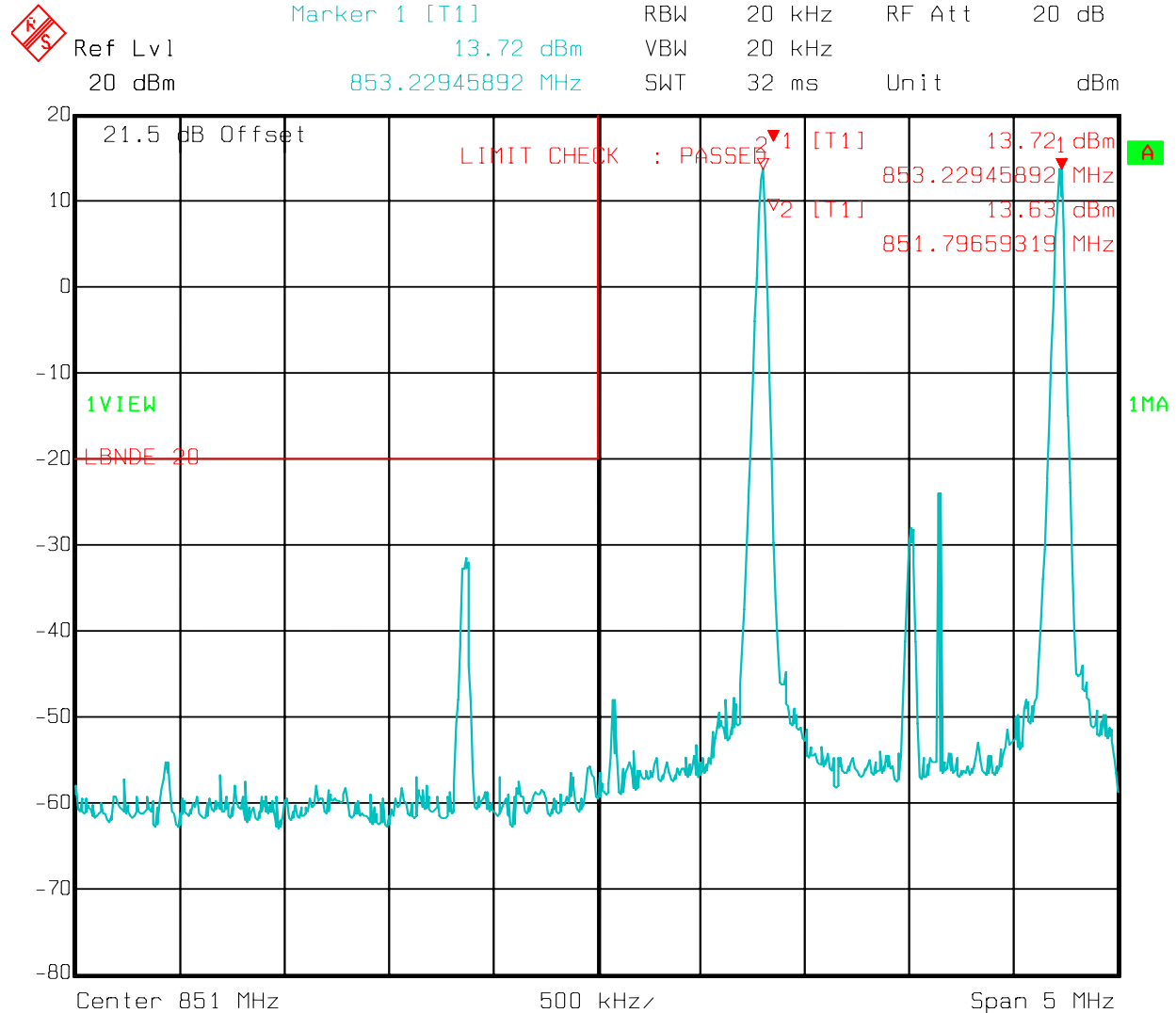
EQUIPMENT: MR803D

PROJECT NO.: 6L0003RUS1

## Test Data – Spurious Emissions at Antenna Terminals

Downlink

iDEN



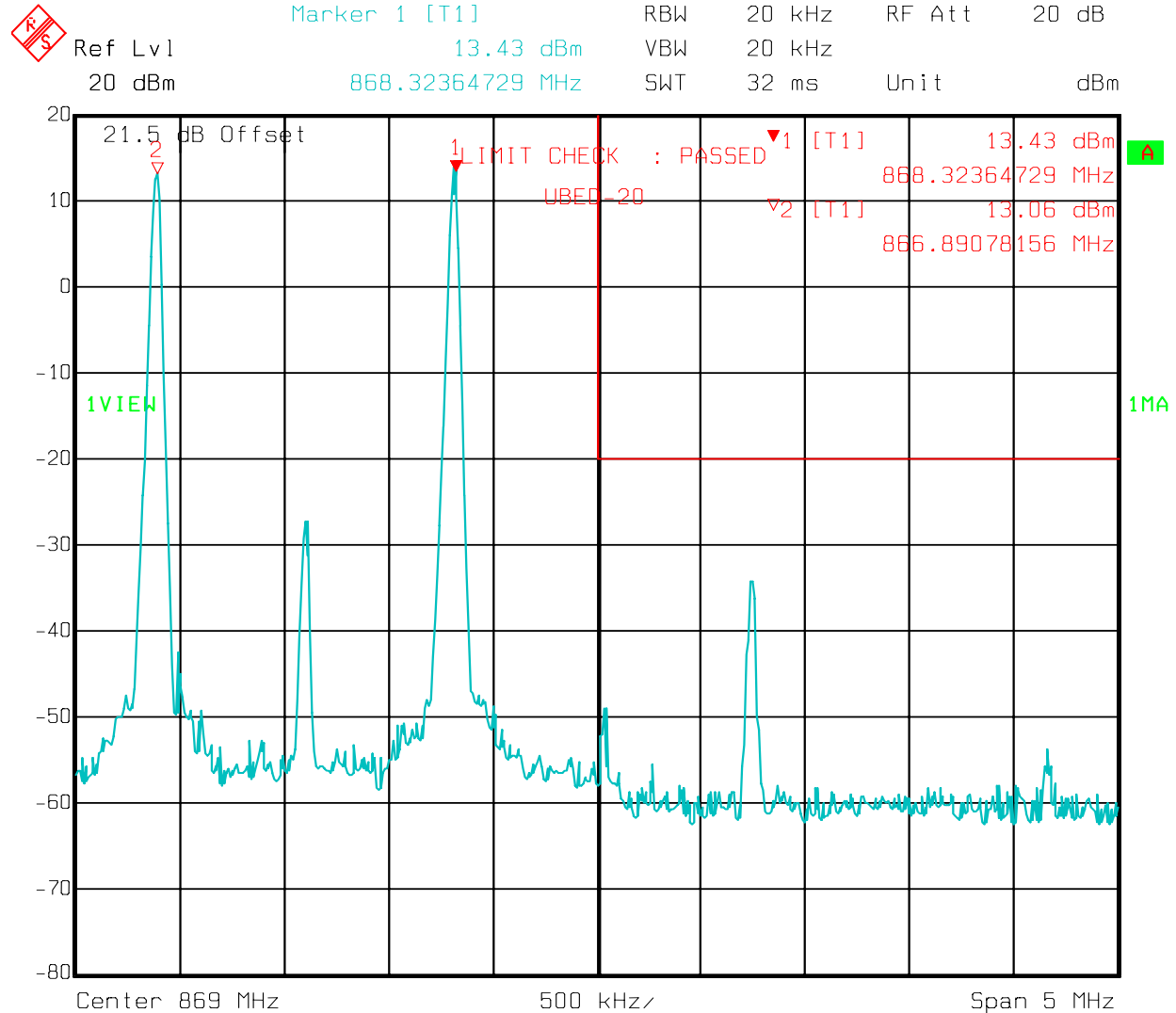
Date: 08.FEB.2006 13:36:56



# Test Data – Spurious Emissions at Antenna Terminals

Downlink

iDEN



Date: 08.FEB.2006 13:40:38

EQUIPMENT: MR803D

PROJECT NO.: 6L0003RUS1

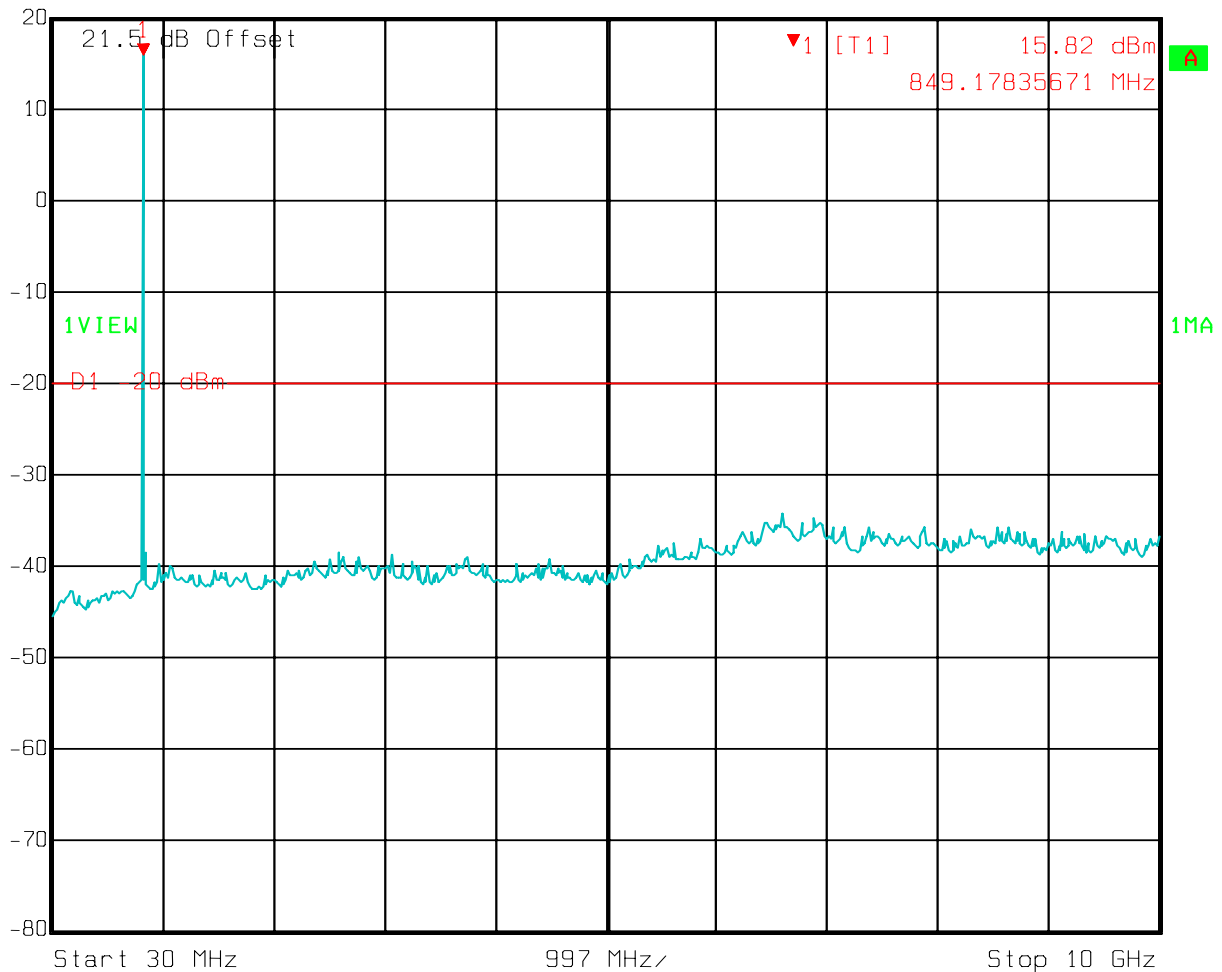
**Test Data – Spurious Emissions at Antenna Terminals**

Downlink

iDEN



Marker 1 [T1] RBW 1 MHz RF Att 20 dB  
15.82 dBm VBW 1 MHz  
849.17835671 MHz SWT 100 ms Unit dBm

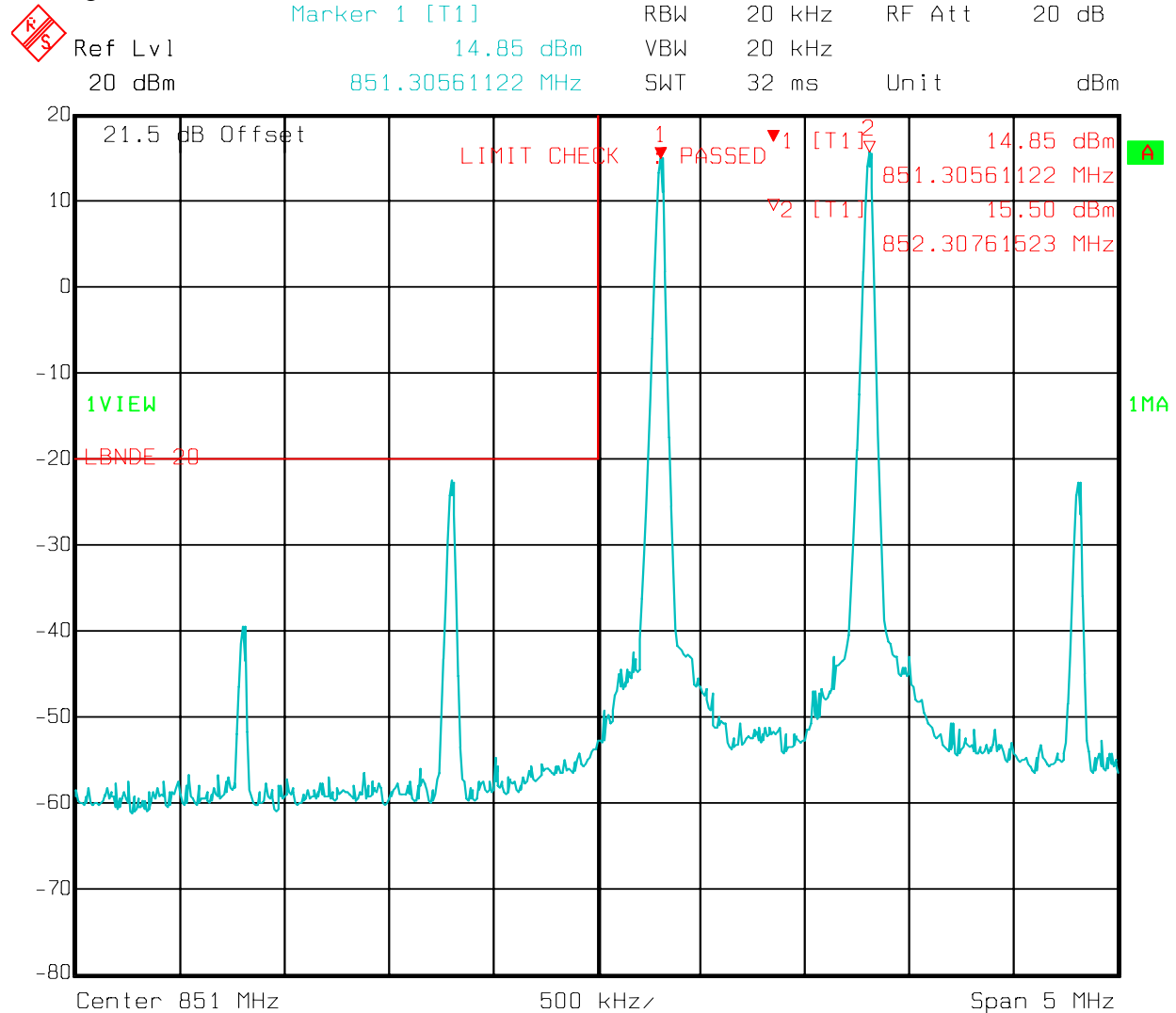


Date: 08.FEB.2006 13:57:36

# Test Data – Spurious Emissions at Antenna Terminals

Downlink

Analog



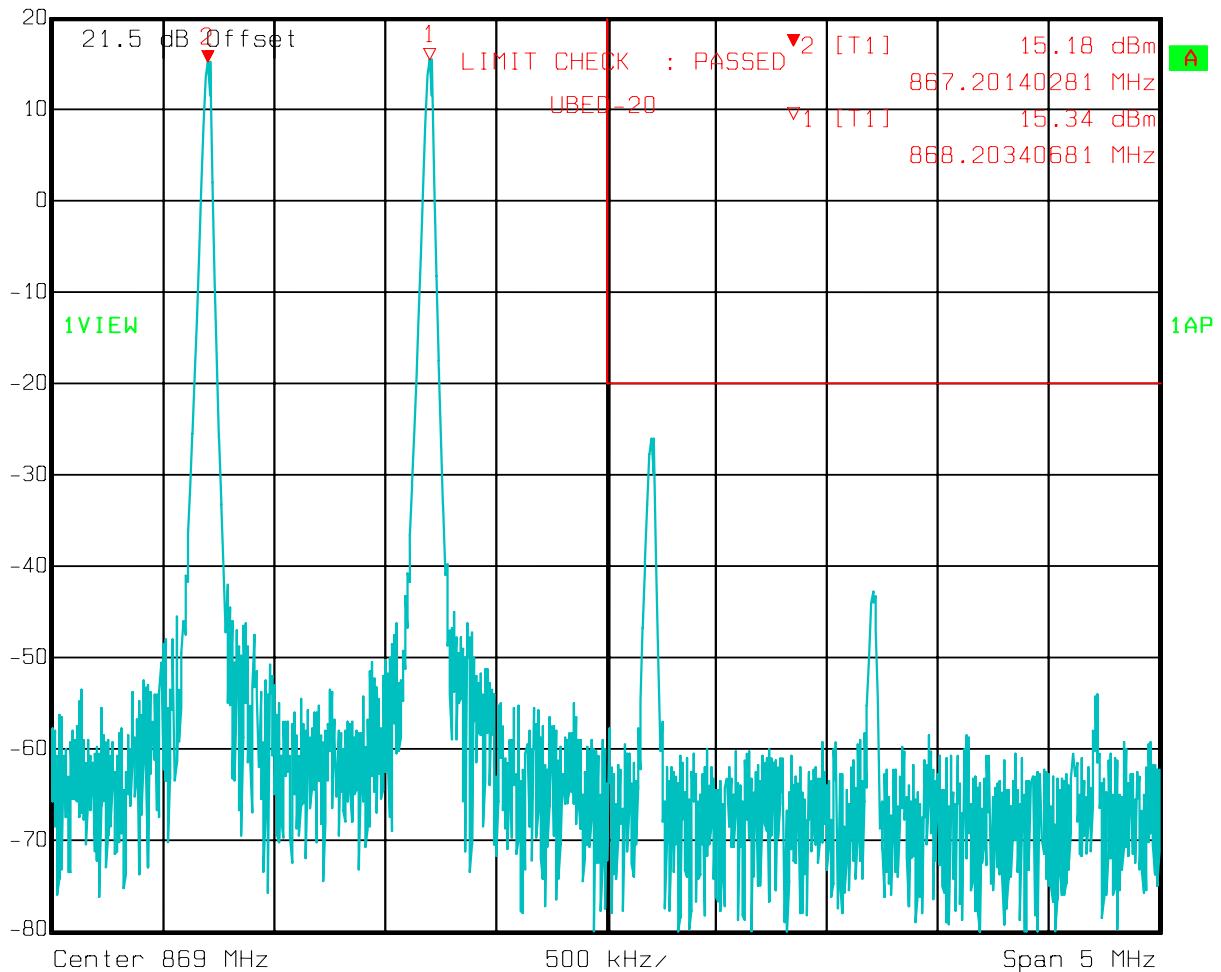
Date: 08.FEB.2006 13:45:46

# Test Data – Spurious Emissions at Antenna Terminals

Downlink

Analog


 Marker 2 [T1] RBW 20 kHz RF Att 20 dB  
 Ref Lvl 15.18 dBm VBW 20 kHz  
 20 dBm 867.20140281 MHz SWT 32 ms Unit dBm

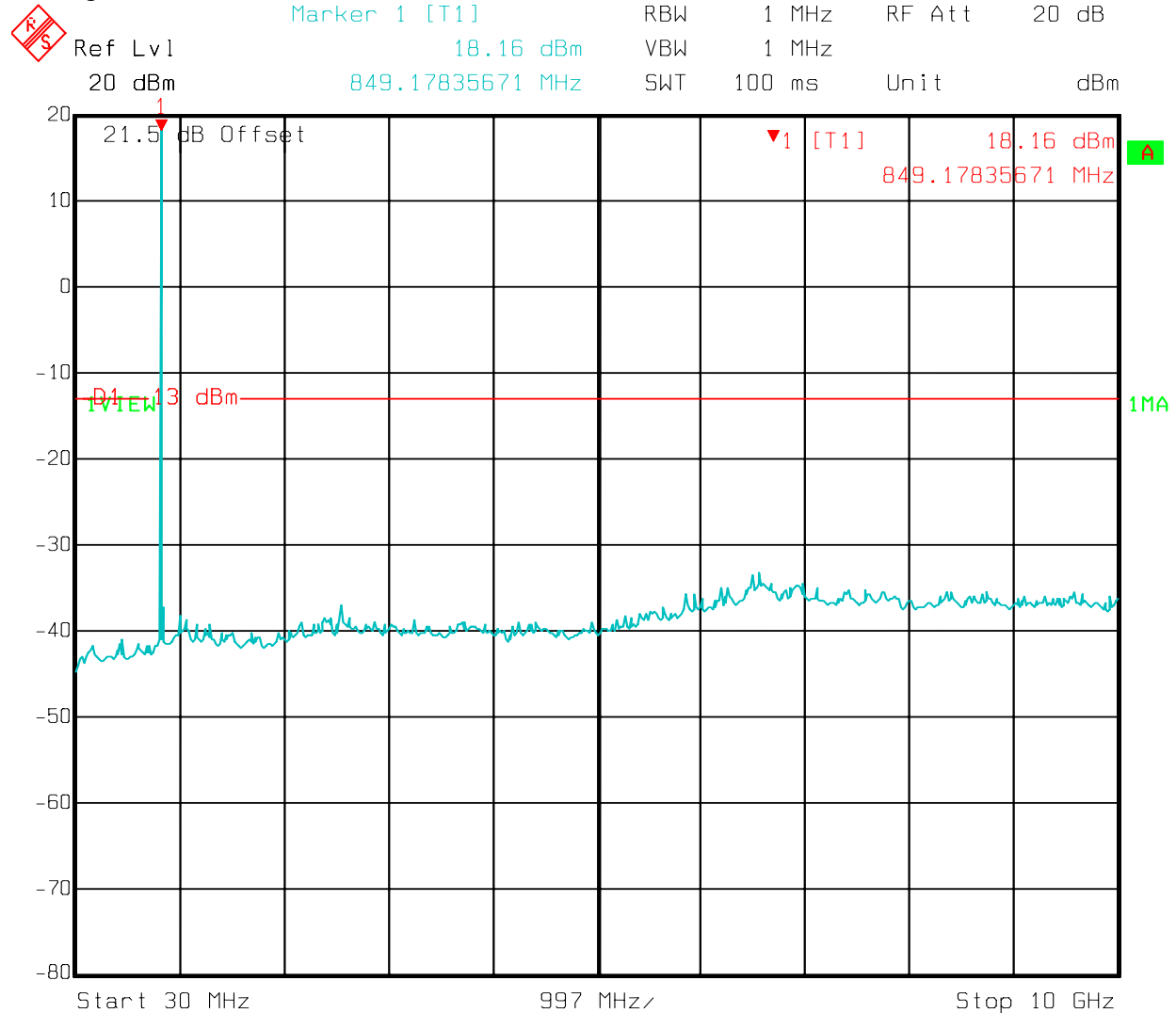


Date: 08.FEB.2006 13:43:14

# Test Data – Spurious Emissions at Antenna Terminals

Downlink

Analog



Date: 08.FEB.2006 14:00:02

**Section 6.            Field Strength of Spurious Emissions**

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.993
TESTED BY: David Light	DATE: 08 February 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. The spectrum was searched from 30 MHz to 10 GHz.**Equipment Used:**    1464-1484-1485-993-1016-791-759-760**Measurement Uncertainty:**            +/- 1.7    dB**Temperature:**            22    °C**Relative Humidity:**            45    %

### Photographs of Test Setup



*EQUIPMENT:* MR803D

PROJECT NO.: 6L0003RUS1

## Section 7 Out of Band Rejection

NAME OF TEST: Out of Band Rejection	PARA. NO.: NA
TESTED BY: David Light	DATE: 08 February 2006

**Test Results:** Complies.

**Test Data:** See attached.

**Equipment Used:** 1036-1472-1626-1053-1052-1081

**Measurement Uncertainty:** +/- 1.7 dB dB  
1x10<sup>-7</sup> ppm


**Temperature:** 22 °C

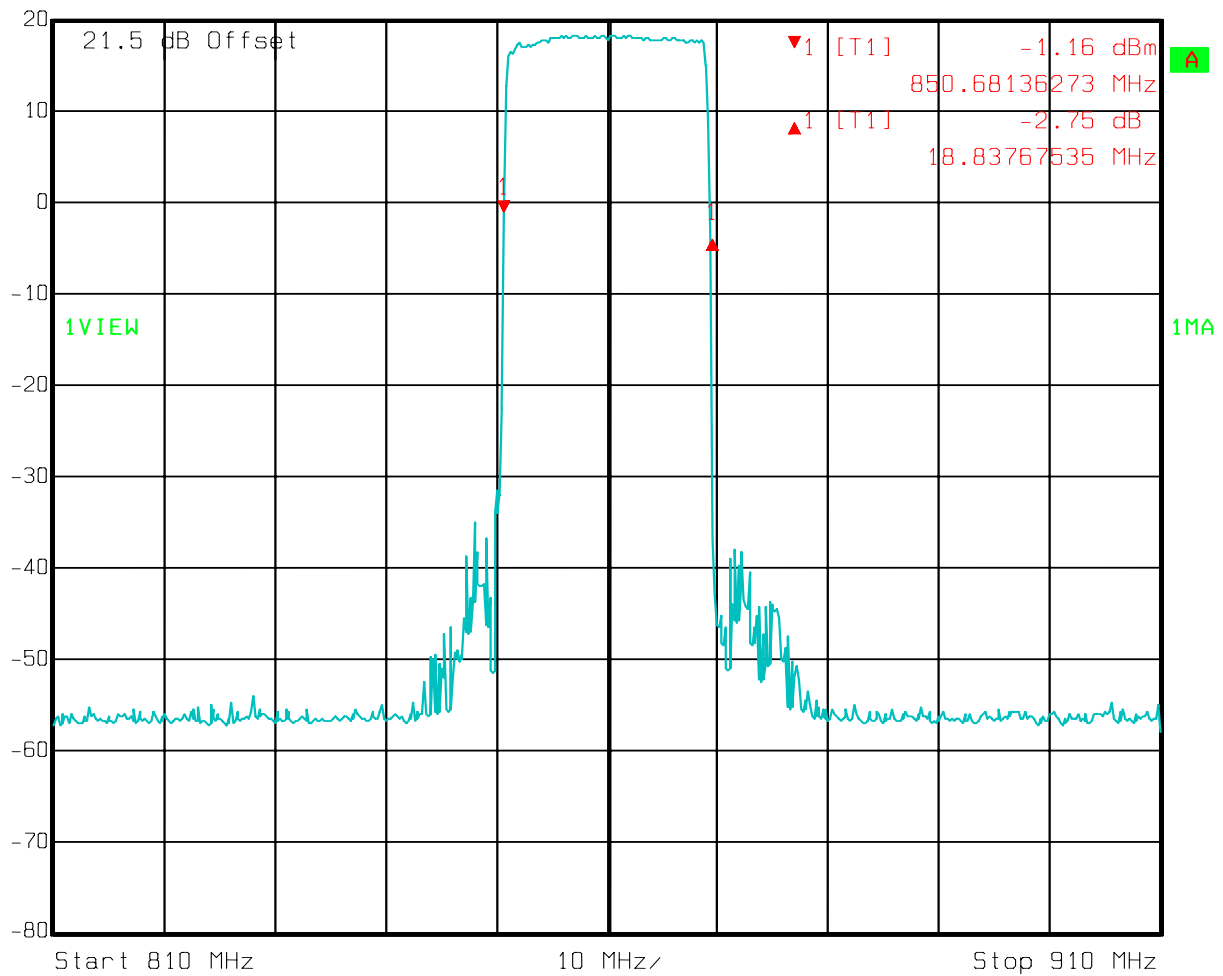
**Relative Humidity:** 45 %



# Test Data – Out of Band Rejection

## Downlink


 Delta 1 [T1] RBW 30 kHz RF Att 20 dB  
 Ref Lvl -2.75 dB VBW 30 kHz  
 20 dBm 18.83767535 MHz SWT 280 ms Unit dBm



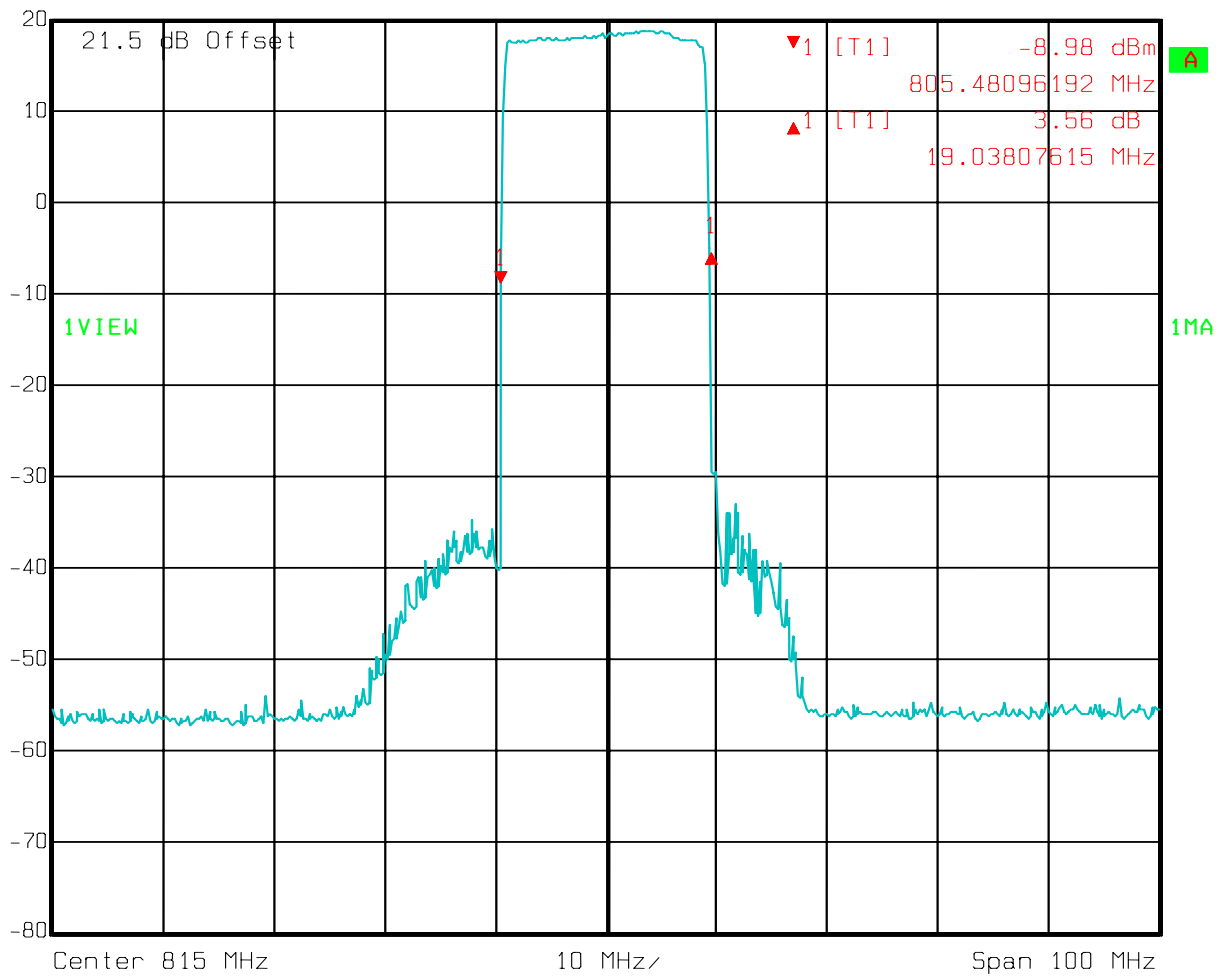
Date: 08.FEB.2006 11:20:46

# Test Data – Out of Band Rejection

## Uplink



Delta 1 [T1] RBW 30 kHz RF Att 20 dB  
Ref Lvl 3.56 dB VBW 30 kHz  
20 dBm 19.03807615 MHz SWT 280 ms Unit dBm



Date: 08.FEB.2006 10:55:18

*EQUIPMENT:* MR803D

PROJECT NO.: 6L0003RUS1

**Section 8. Test Equipment List**

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	03/22/04	03/23/06
1472	20db Attenuator DC 18 Ghz	Omni Spectra 20600-20db	NONE	CBU	N/A
1626	CABLE, 5 ft	MEGAPHASE 10311 1GVT4	N/A	CBU	N/A
1053	VECTOR SIGNAL GENERATOR 300 KHz	ROHDE & SCHWARZ SMIQ 03	DE22081	09/29/05	09/30/08
1052	I/Q MODULATION GENERATOR	Rhode & Schwarz AMIQ	DE30619	CNR	N/A
1081	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	CBU	N/A
791	PREAMP, 25dB	ICC LNA25	398	11/12/05	11/12/06
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	11/12/05	11/12/06
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	09/28/05	09/28/06
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	09/28/05	09/28/06
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/14/05	01/15/07
759	ANTENNA, LOG PERIODIC	A.H. SYSTEMS SAS-200/510	556	08/04/05	08/04/06
760	Antenna biconical	Electro Metrics MFC-25	477	08/04/05	08/04/06

**Nemko USA**

FCC PART 90, SUBPART I  
PRIVATE LAND MOBILE REPEATER

*EQUIPMENT:* **MR803D**

PROJECT NO.: **6L0003RUS1**

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## **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 or spectrum analyzer. Power output is measured with the maximum rated input level.

Integral Antenna:

If the antenna is not detachable from the circuit then the Peak Power Output is derived from the peak radiated field strength of the fundamental emission by using the plane wave relation  $GP/4\pi R^2 = E^2/120\pi$  and proceeding as follows:

$$P = \frac{E^2 R^2}{30G} = \frac{E^2 3^2}{30G}$$

where,

P = the equivalent isotropic radiated power in watts

E = the maximum measured field strength in V/m

R = the measurement range (3 meters)

G = the numeric gain of the transmit antenna in relation to an isotropic radiator

FCC PART 90, SUBPART I  
PRIVATE LAND MOBILE REPEATER

PROJECT NO.: 6L0003RUS1

**PARA. NO.: 2.991**

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:* MR803DPROJECT NO.: 6L0003RUS1

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**NAME OF TEST: Occupied Bandwidth****PARA. NO.: 2.989****Minimum Standard:** Para. No. 90.210, see table 1 below for applicable mask.**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

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

An example of attenuation requirement of  $50 + 10 \log P$  is equivalent to -20 dBm ( $1 \times 10^{-5}$  Watts) at the antenna terminal. We determine the field strength limit by using the plane wave relation.

$$GP/4\pi R^2 = E^2/120\pi$$

For emissions  $\leq 1$  GHz:

$G = 1.64$  (Dipole Gain)

$P = 10^{-5}$  Watts (Maximum spurious output power)

$R = 3$  m (Measurement Distance)

$$E = \frac{\sqrt{30GP}}{R} = E = \frac{\sqrt{30 \times 1.64 \times 10^{-5}}}{3} = 0.00739 \text{ V / m} = 77.4 \text{ dB}\mu\text{V / m}$$

For emissions  $> 1$  GHz:

$G = 1$  (Isotropic Gain)

$P = 1 \times 10^{-5}$  Watts (Maximum spurious output power)

$R = 3$  m (Measurement Distance)

$$E = 77.4 - 20 \log \sqrt{1.64} = 75.2 \text{ dB}\mu\text{V / m@3m}$$

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



*EQUIPMENT:* MR803D

PROJECT NO.: 6L0003RUS1

**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	-	-	-

**Nemko USA**

FCC PART 90, SUBPART I  
PRIVATE LAND MOBILE REPEATER

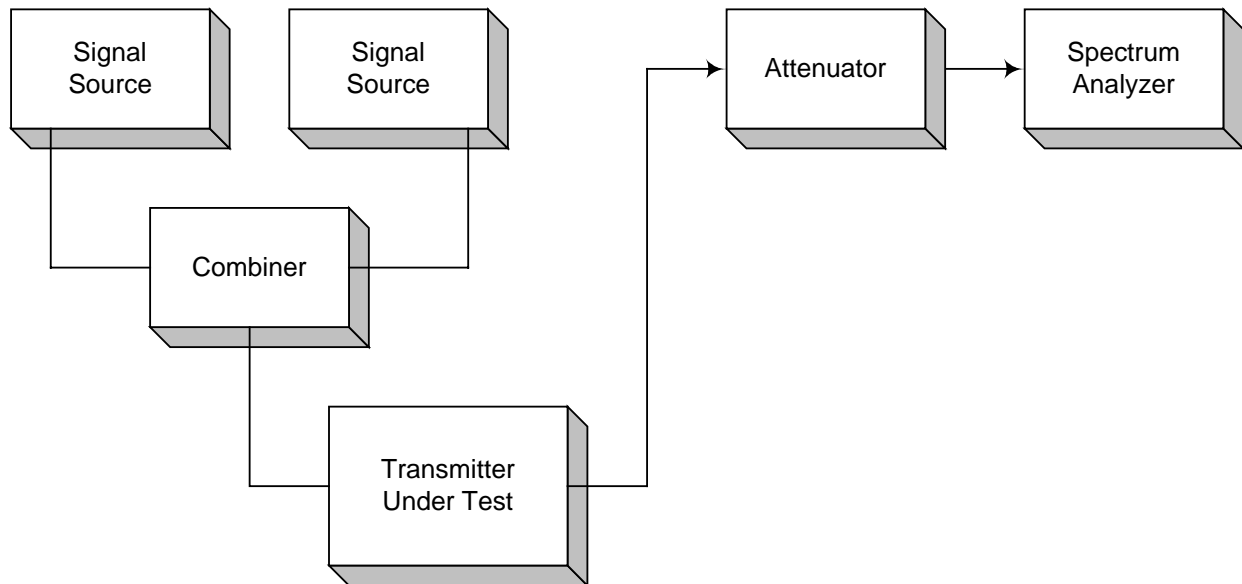
*EQUIPMENT:*    **MR803D**

PROJECT NO.:    **6L0003RUS1**

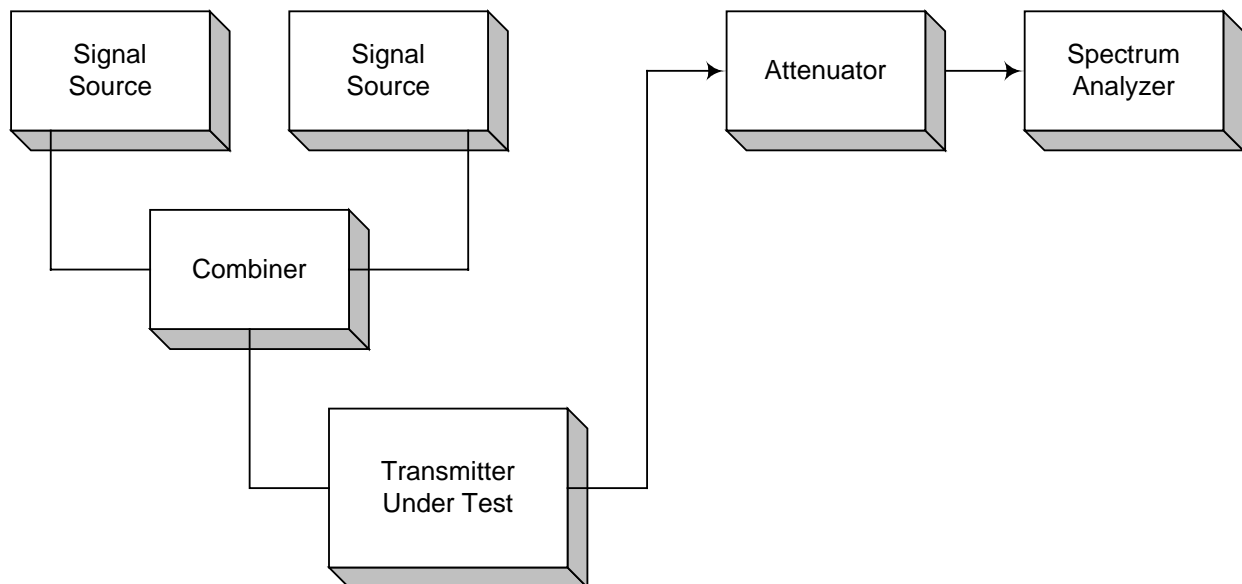
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## **ANNEX B - TEST DIAGRAMS**

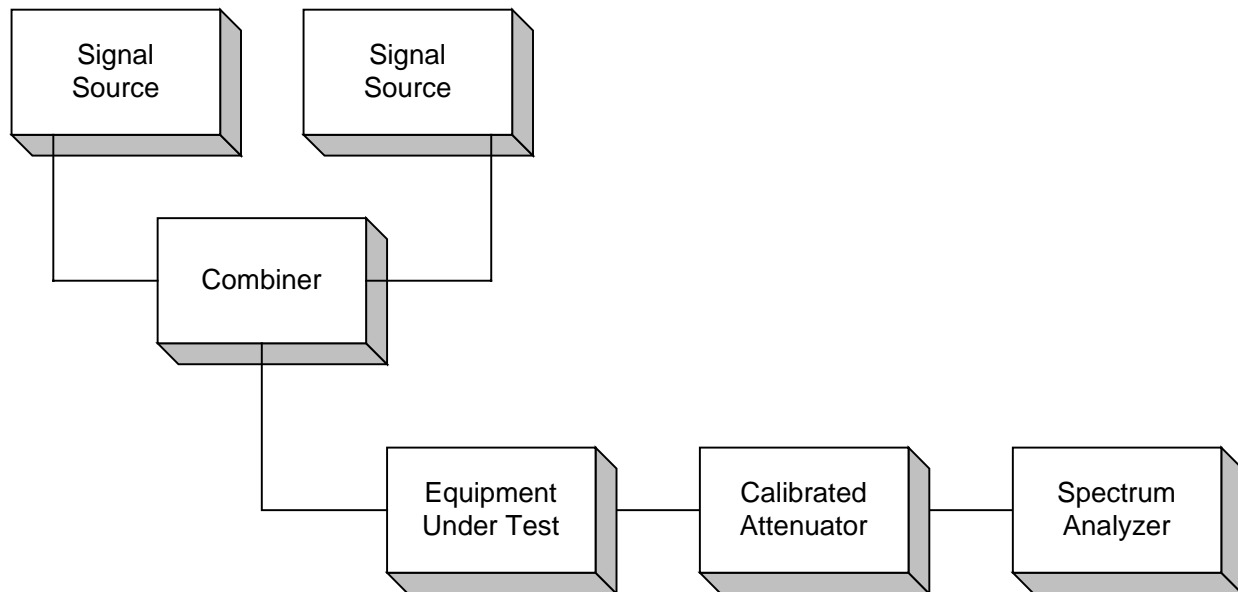
**Para. No. 2.985 - R.F. Power Output**



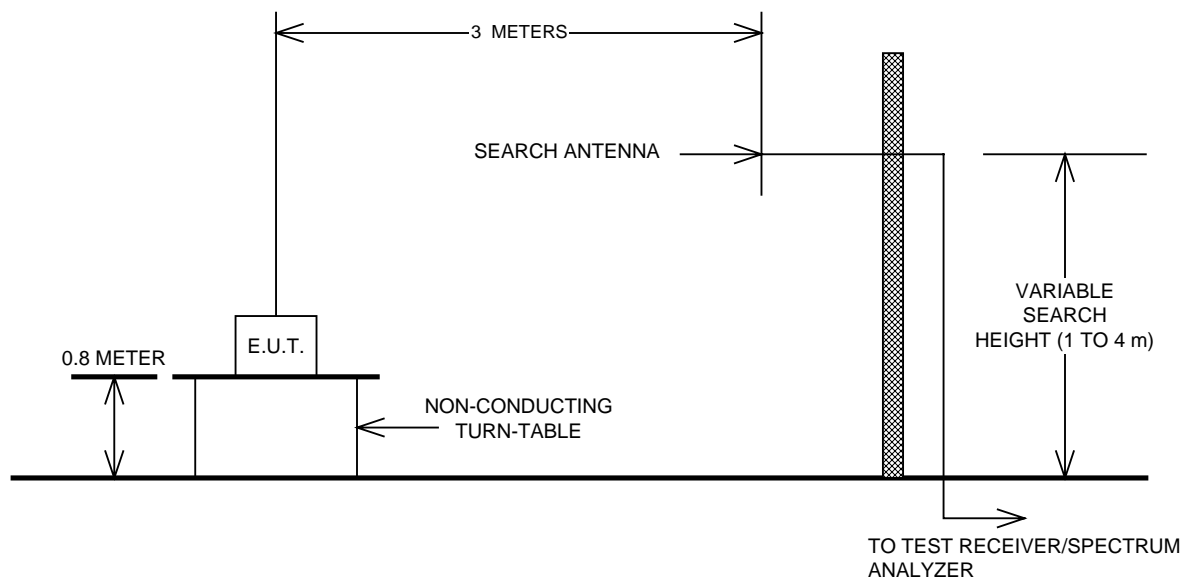
**Para. No. 2.989 - Occupied Bandwidth**



**Para. No. 2.991 - Spurious Emissions at Antenna Terminals**



**Para. No. 2.993 - Field Strength of Spurious Radiation**



**Para. No. 2.995 - Frequency Stability**

