Nemko Test Report:	4L0492RUS1REV2
Applicant:	Andrew Corporation
Equipment Under Test: (E.U.T.)	Optical Repeater
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:	 Tom Tidwell, Frontline Manager
Date:	2 November, 2004
Total Number of Pages:	70

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Section 1. Summary of Test Results

Manufacturer:	Andrew Corporation
Model No.:	TFAN 80/90
Serial No.:	042602622

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".

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	MEAS.	RESULT
RF Power Output	90.205		39.02	Complies
Audio Frequency Response	TIA EIA-603.3.2.6	N/A	N/A	N/A
Audio Low-Pass Filter Response	TIA EIA-603.3.2.6	N/A	N/A	N/A
Modulation Limiting	TIA EIA-603.3.2.6	N/A	N/A	N/A
Occupied Bandwidth	90.210	Plots	Plots	Complies
Spurious Emissions at Antenna Terminals	90.210	-13 dBm	Plots	Complies
Field Strength of Spurious Emissions	90.210	-13 dBm E.R.P.	E.R.P.	Complies
Frequency Stability	90.213			Complies
Transient Frequency Behavior	90.214	N/A	N/A	N/A

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.

Indoor Temperature: 21°C
Humidity: 51%

Outdoor Temperature: 19 °C
Humidity: 65 %

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Section 2. General Equipment Specification

Transmitter

Supply Voltage Input: 115V AC

Frequency Range: 935-960MHz
851-869MHz

Tunable Bands: 935-960MHz

20 dB Passband:

Type(s) of Modulation:

F3E (Voice)	F1D	F2D	GXW (QAM)	Other
☐	☐	☐	☒	☐

Maximum Input: +0dBm

Output Impedance: NA

RF Power Output (rated): **Single:** 13dBm
Composite: 10dBm (2-Carrier)

Frequency Translation:

F1-F1	F1-F2	N/A
☐	☐	☒

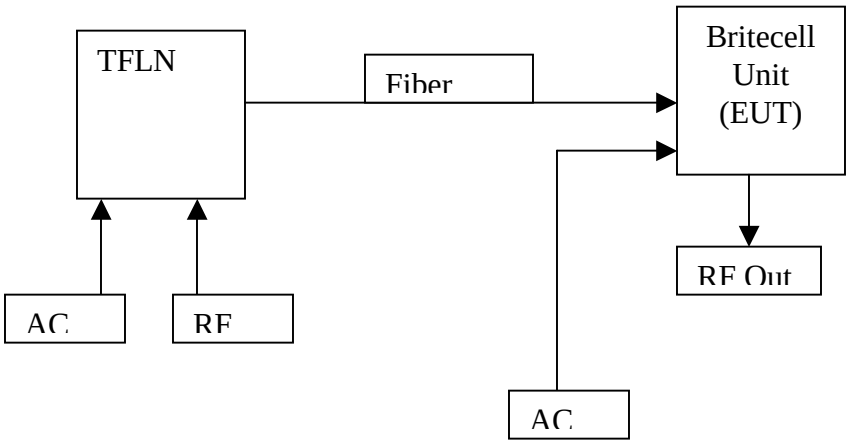
Band Selection:

Software	Duplexer Change	Fullband Coverage
☐	☐	☒

Modifications Made During Testing

No Modifications made during testing

System Diagram



Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.985
TESTED BY: Dustin Oaks	DATE: 08/13/2004

Test Results: Complies

Measurement Data:

900 Band

Frequency (MHz)	Measured Power (mW)	Measured Power (dBm)	Rated Power (dBm)
iDEN	33.65	15.27	15.00
ANALOG	132.13	21.21	21.00

800 Band

Frequency (MHz)	Measured Power (mW)	Measured Power (dBm)	Rated Power (dBm)
iDEN	32.51	15.12	15.00
ANALOG	127.64	21.06	21.00

Equipment Used: 1036, 1053, 1627, 1471, 1973

Measurement Uncertainty: +/- 1.6 dB

Temperature: 21 °C

Relative Humidity: 51 %

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.989
TESTED BY: Dustin Oaks	DATE: 08/13/2004

Test Results: Complies

Test Data: See attached graph(s).

Equipment Used: 1036, 1053, 1627, 1471, 1973, 1092

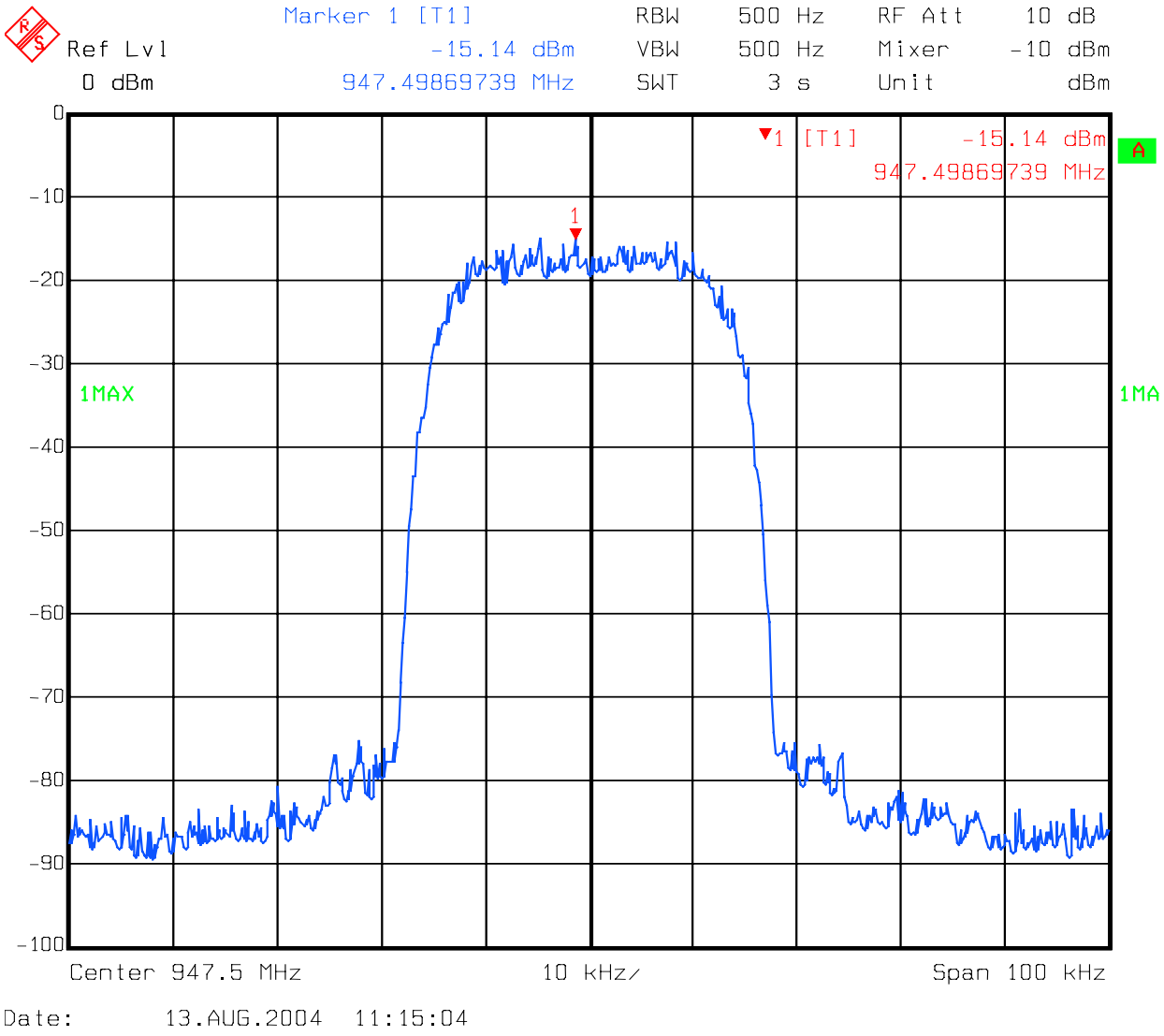
Measurement Uncertainty: +/- 1.6 dB

Temperature: 21 °C

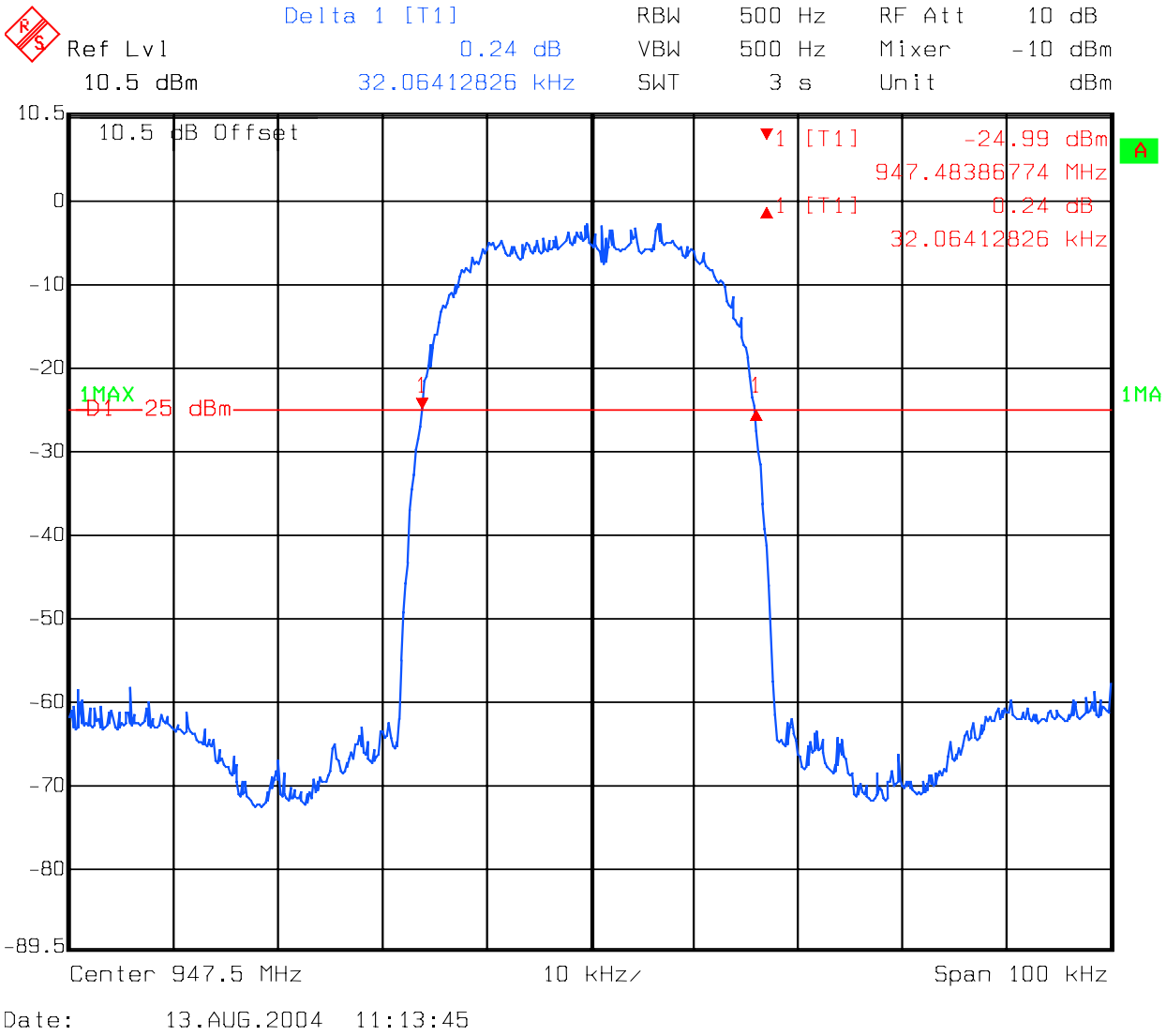
Relative Humidity: 51 %

Band Width and Input/Output

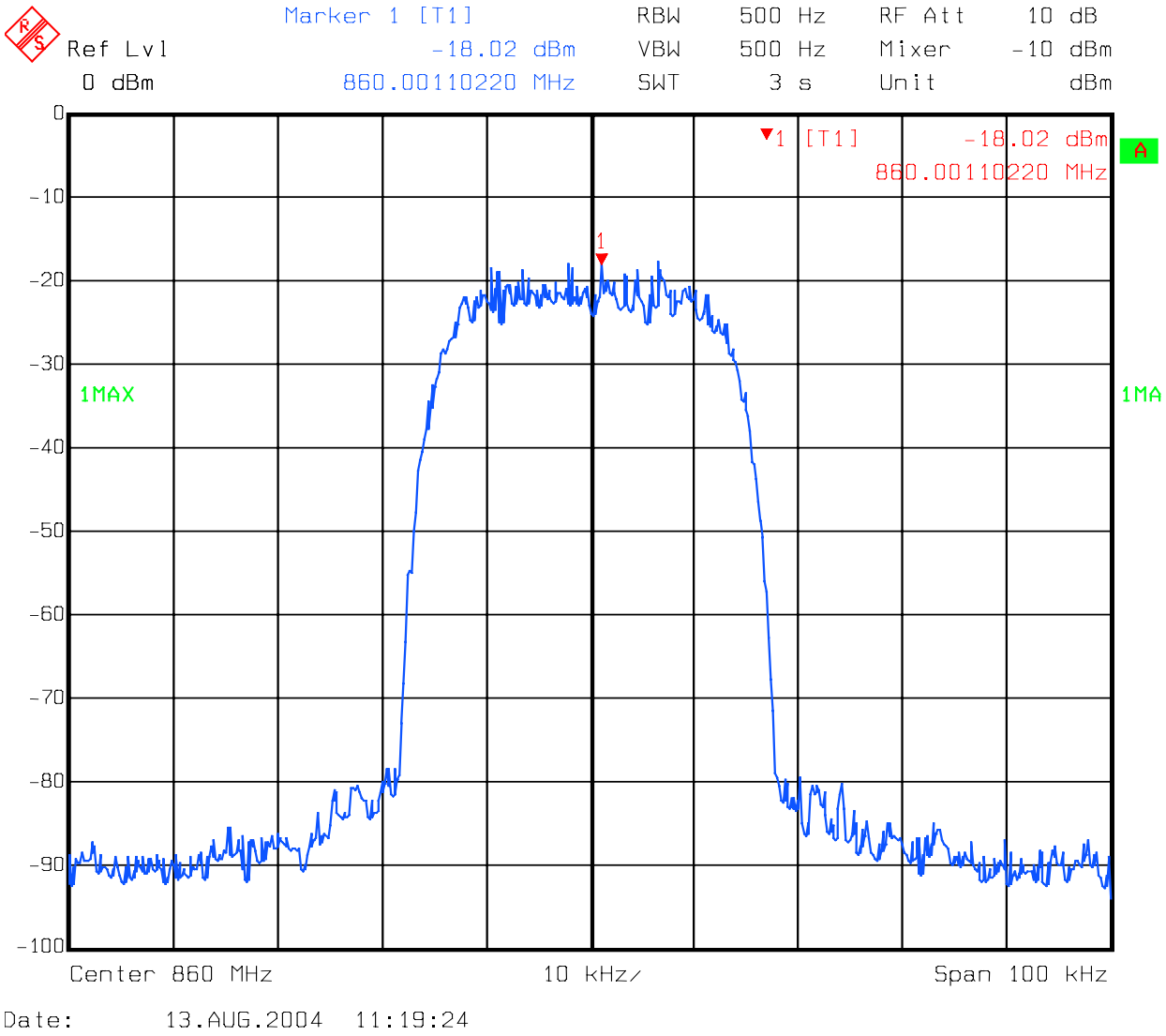
Input iDEN (900 Band)



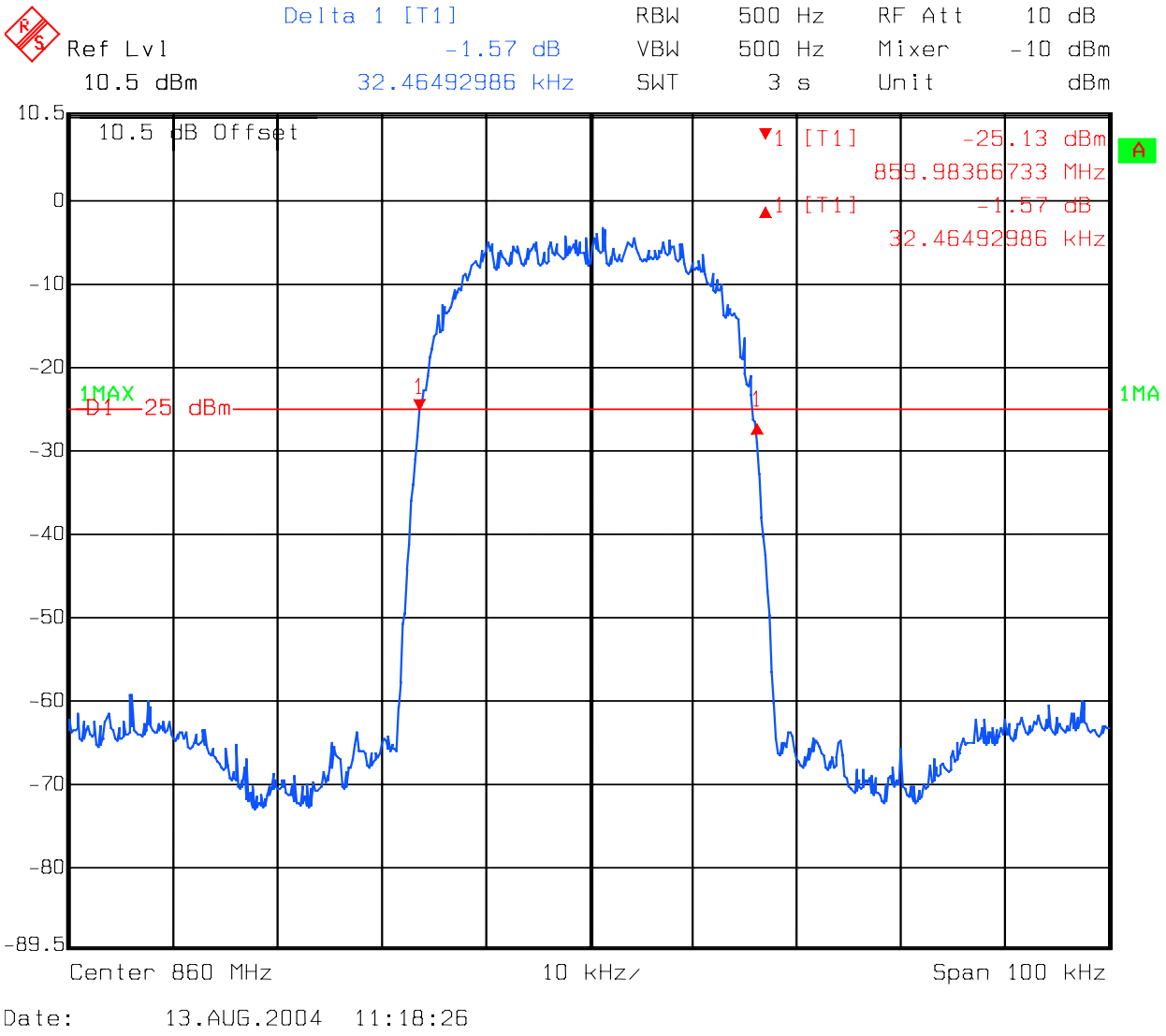
Output iDEN (900 Band)



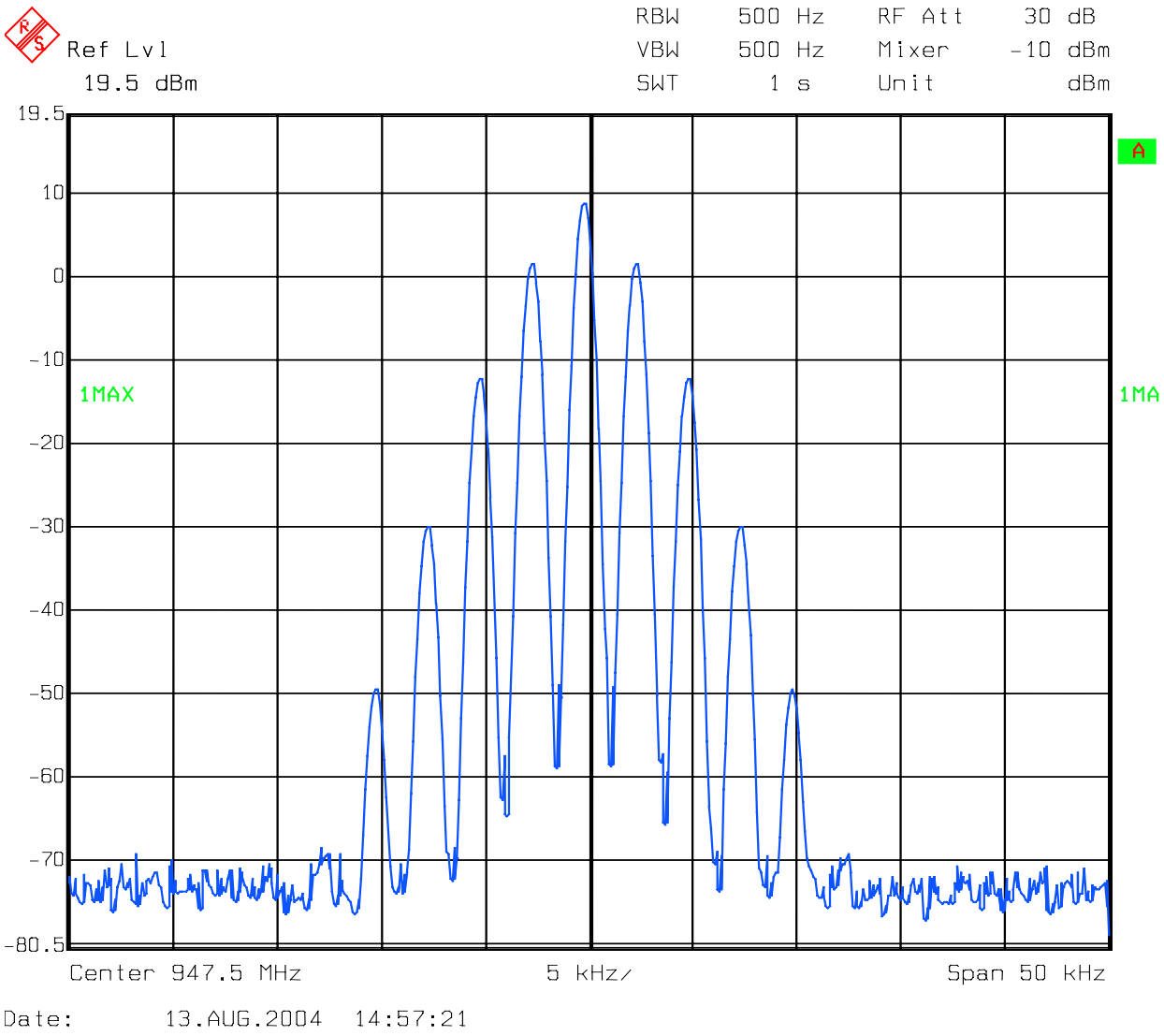
Input iDEN (800 Band)



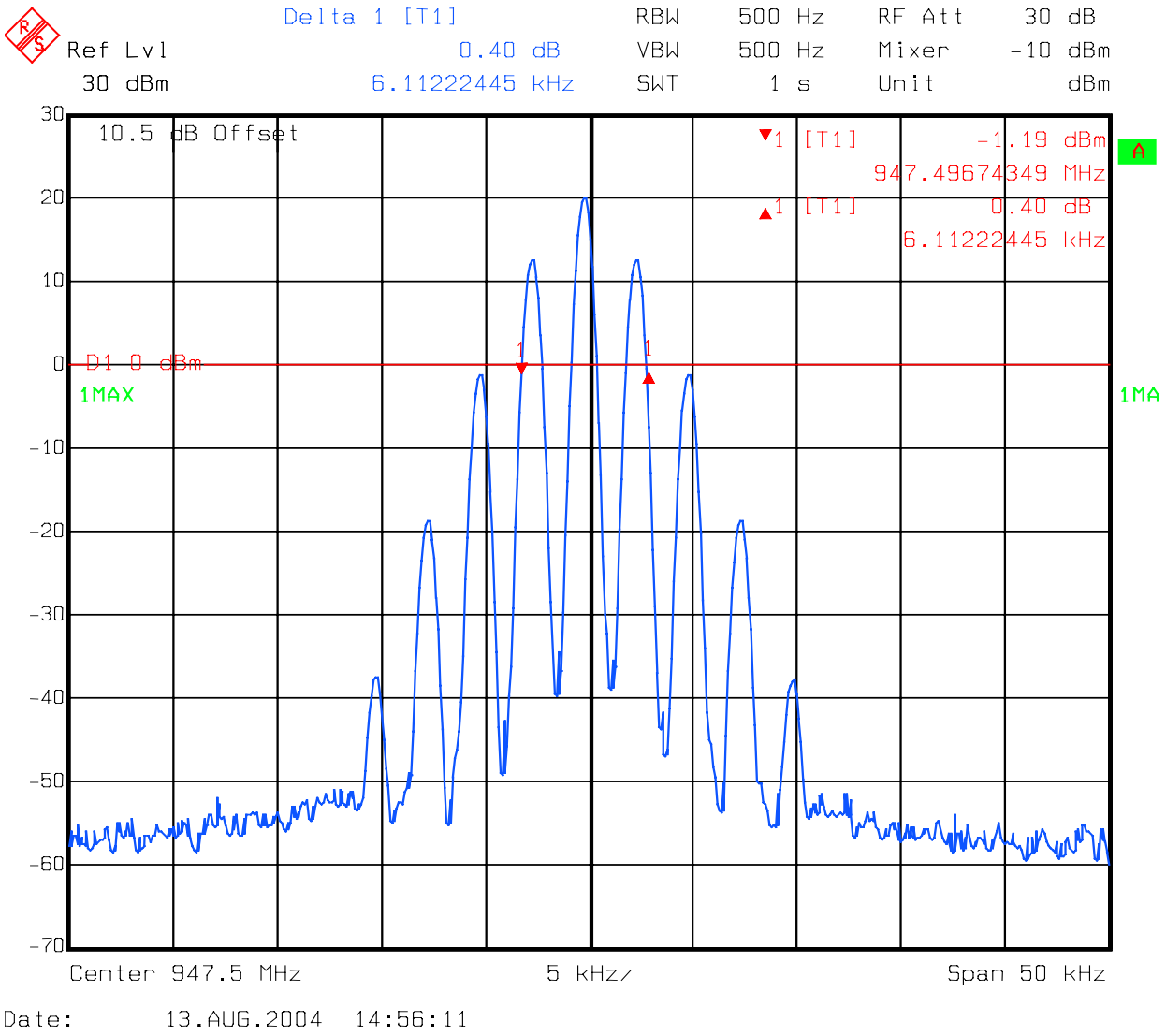
Output iDEN (800 Band)



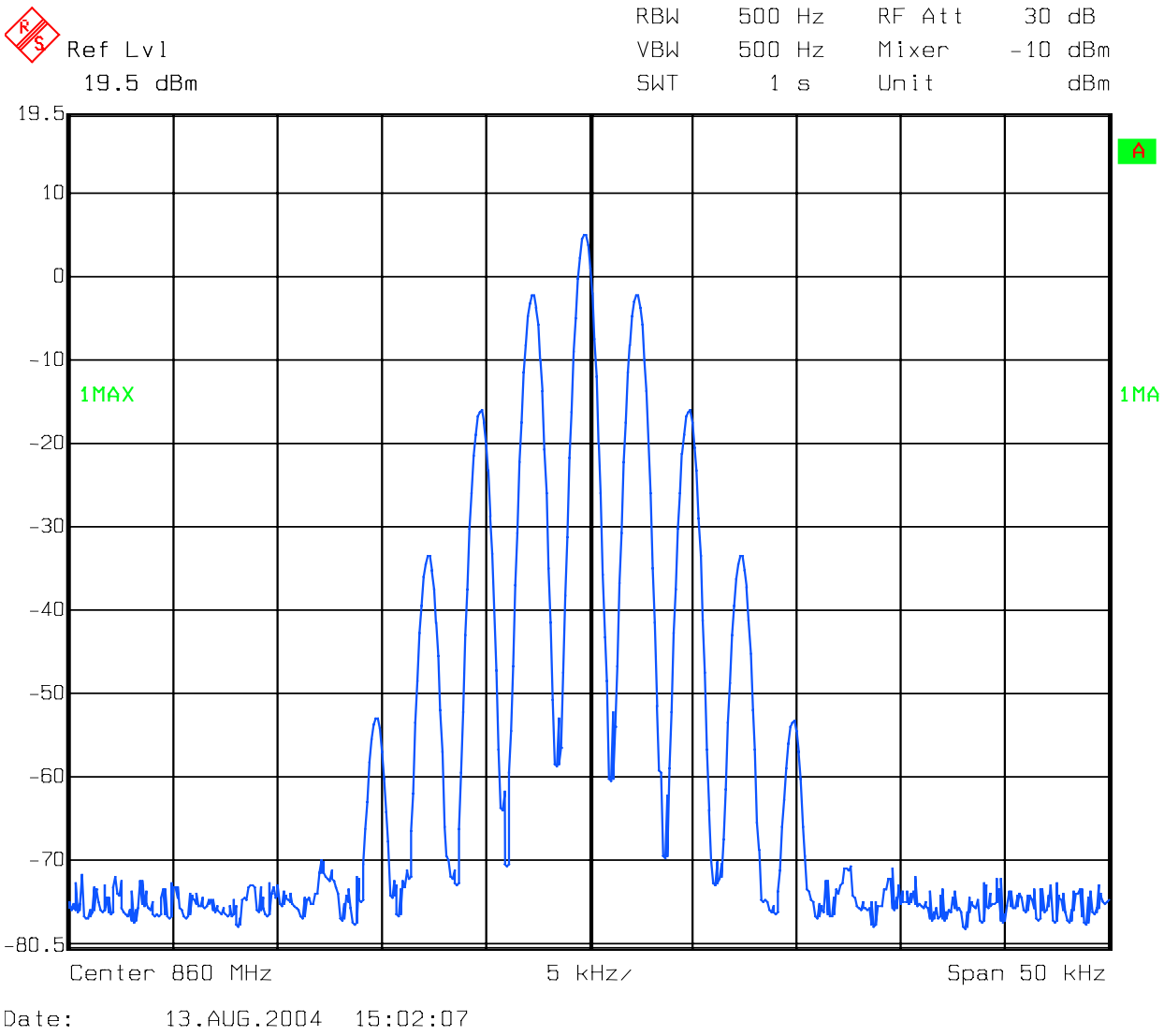
Input ANALOG (900 Band)



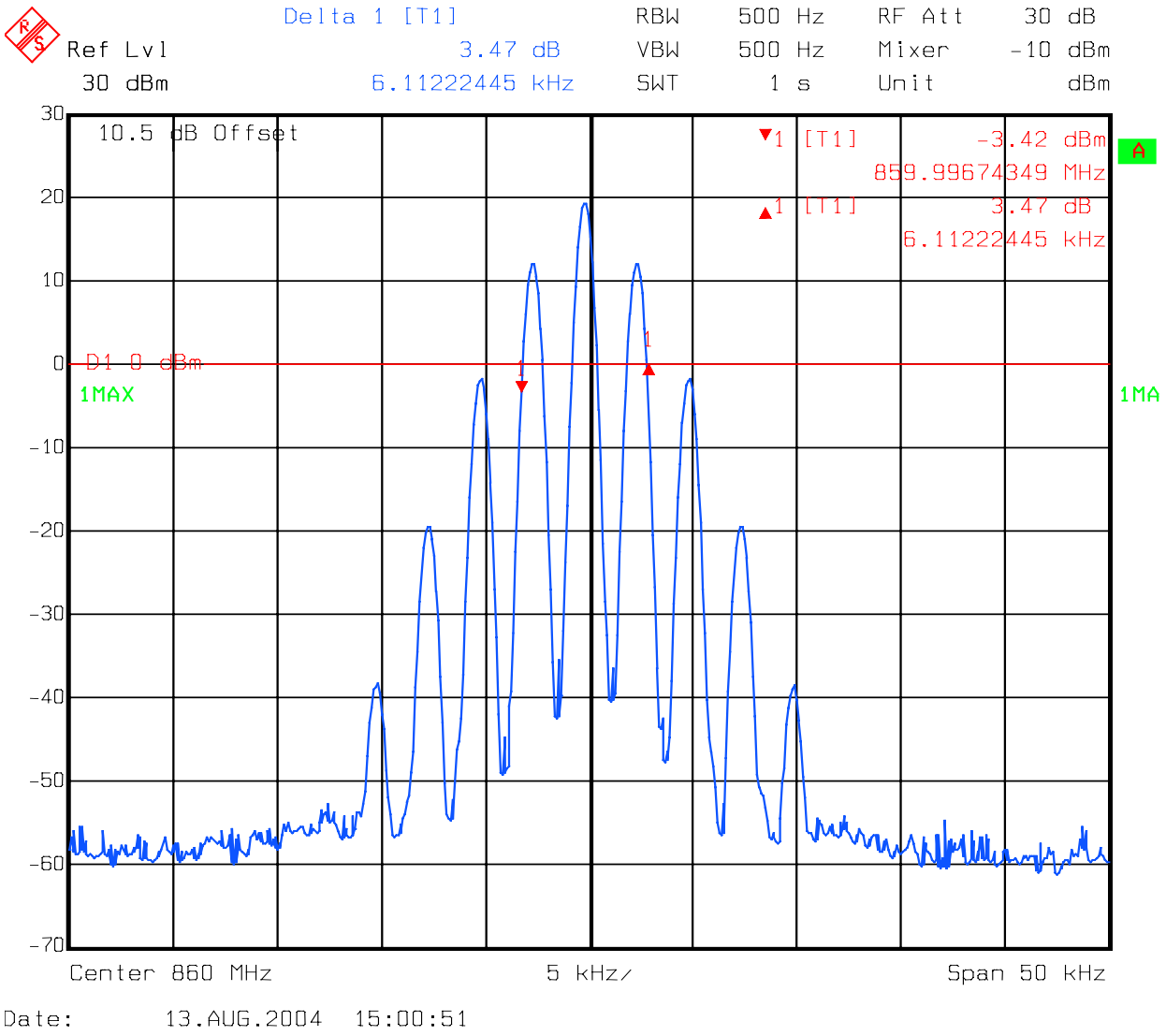
Output ANALOG (900 Band)


Delta 1 [T1]
0.40 dB
6.11222445 kHz
RBW 500 Hz
VBW 500 Hz
SWT 1 s
RF Att 30 dB
Mixer -10 dBm
Unit dBm
Ref Lvl
30 dBm
10.5 dB Offset
1 [T1] -1.19 dBm
947.49674349 MHz
1 [T1] 0.40 dB
6.11222445 kHz
D1 0 dBm
1MAX
1MA
A
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
Center 947.5 MHz
5 kHz/
Span 50 kHz
Date: 13.AUG.2004 14:56:11

Input ANALOG (800 Band)

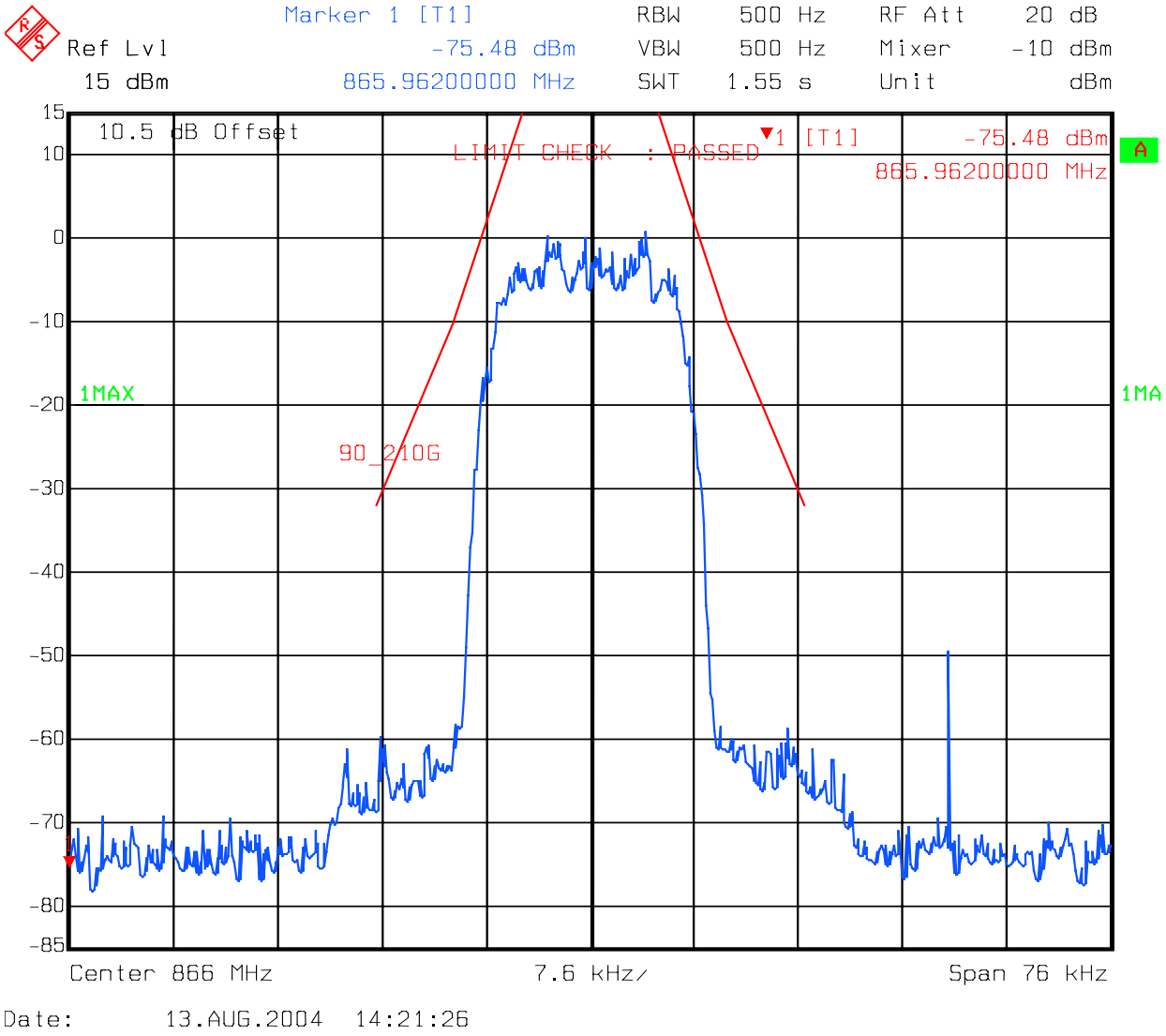


Output ANALOG (800 Band)

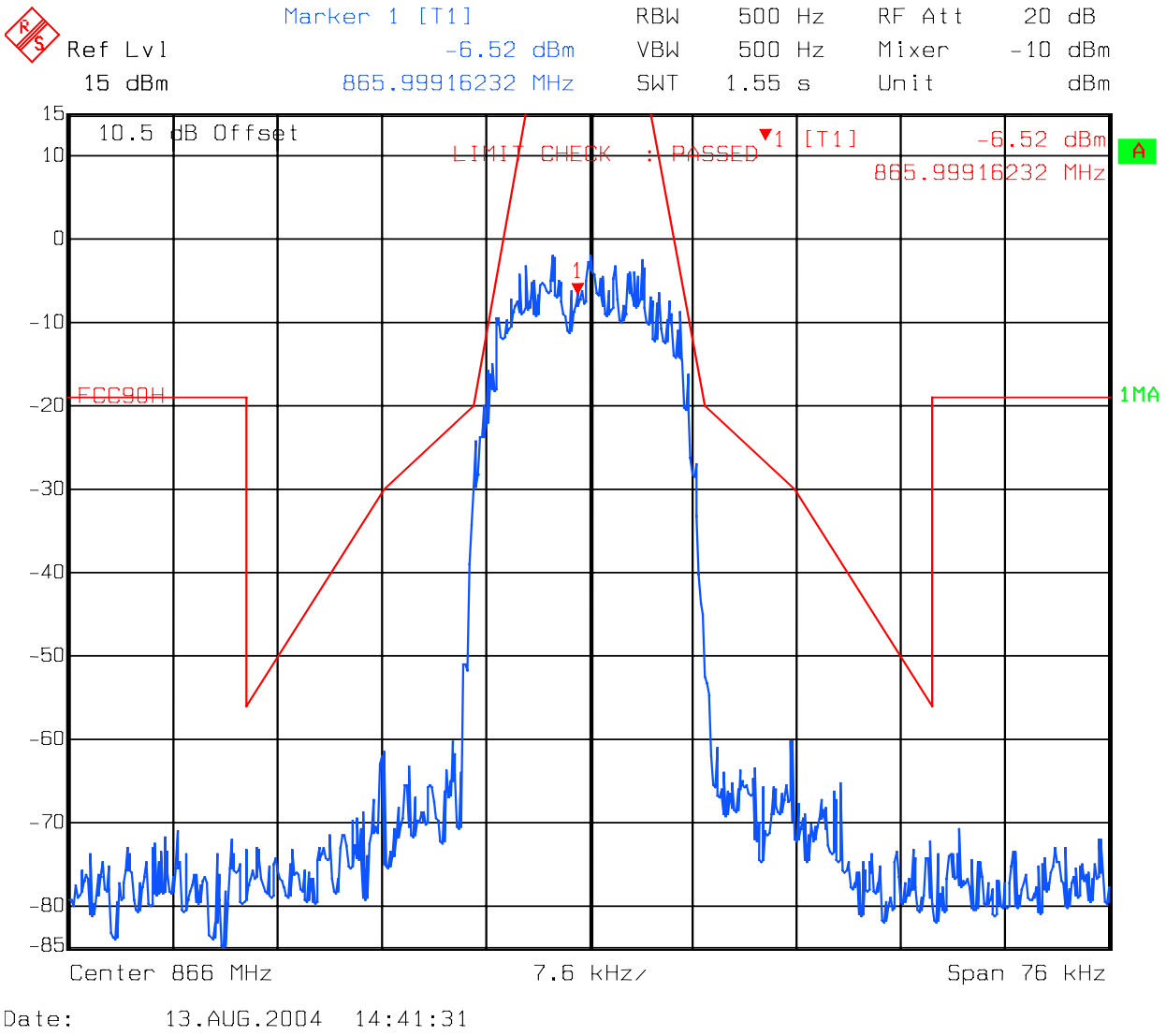


Emissions Mask

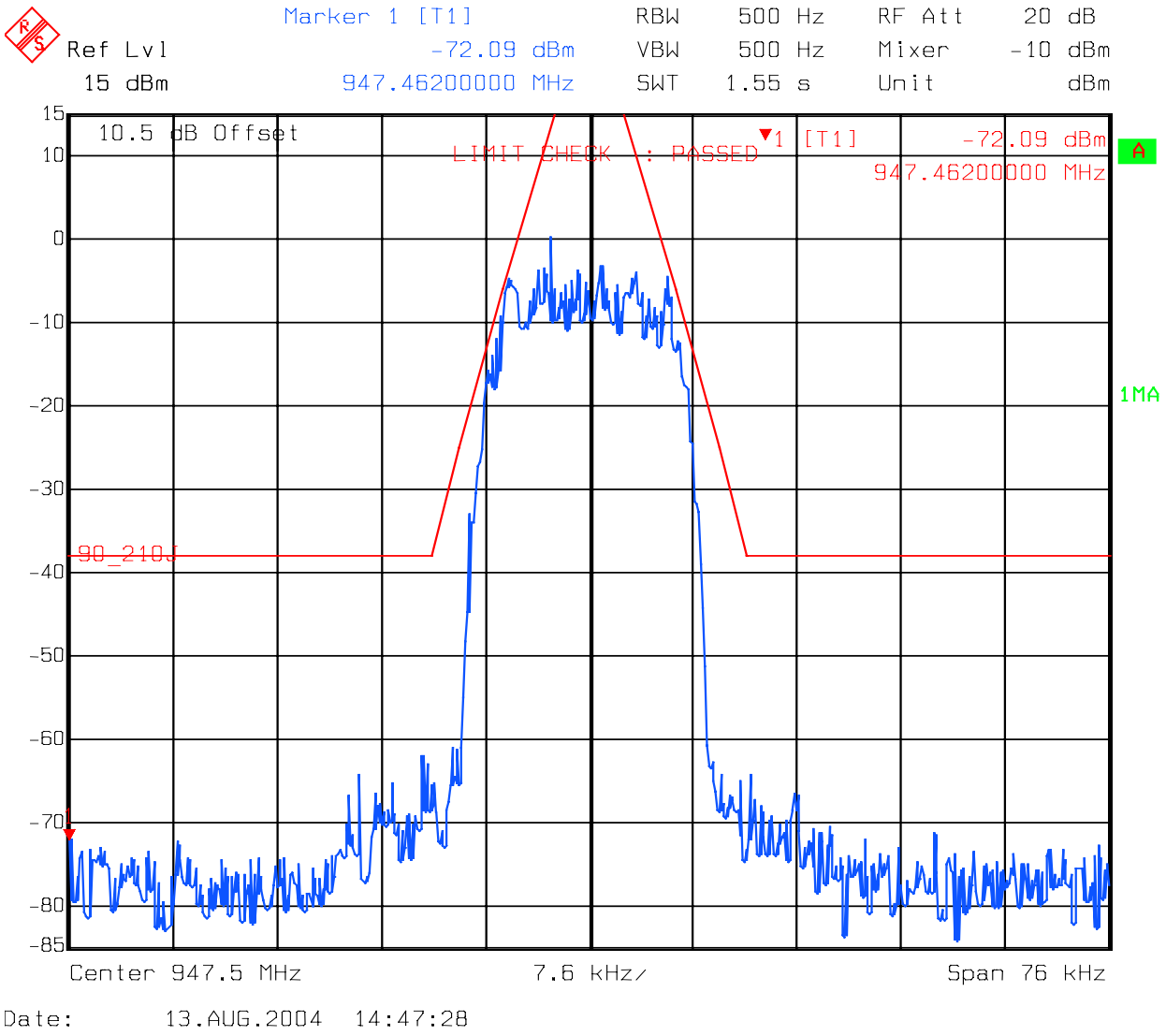
iDEN 800Band, Mask G



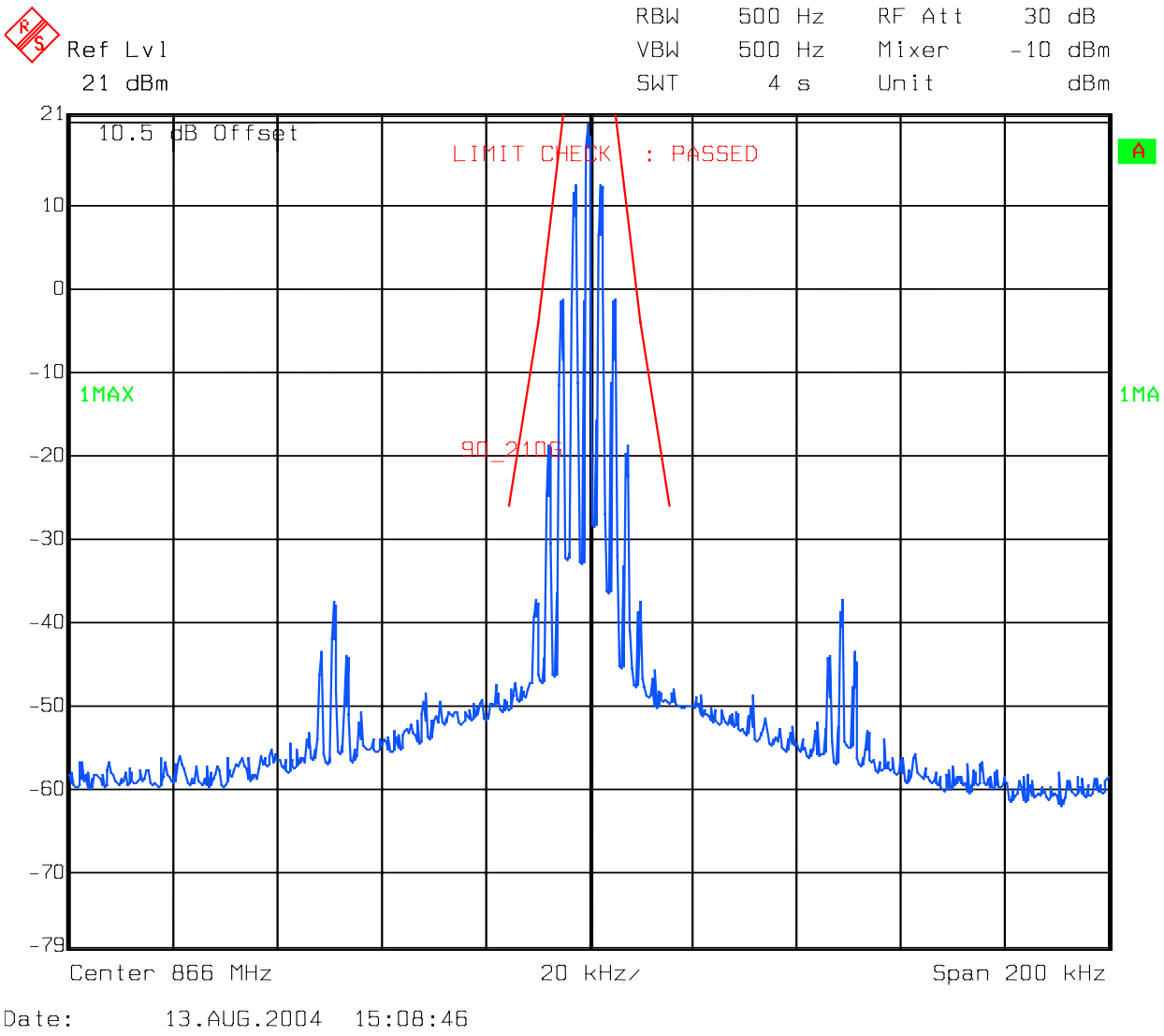
iDEN 800Band, Mask H



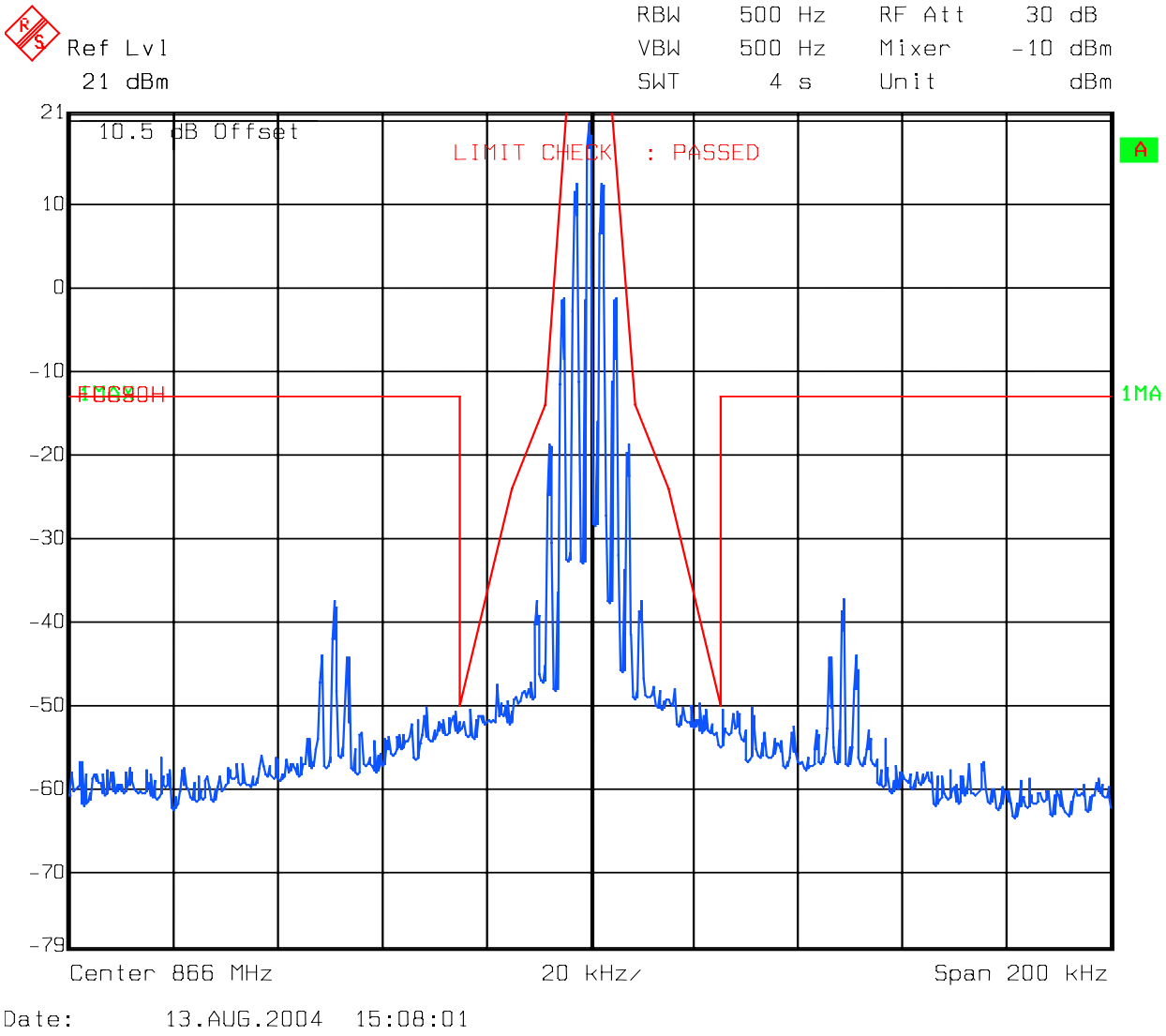
iDEN 900Band, Mask J



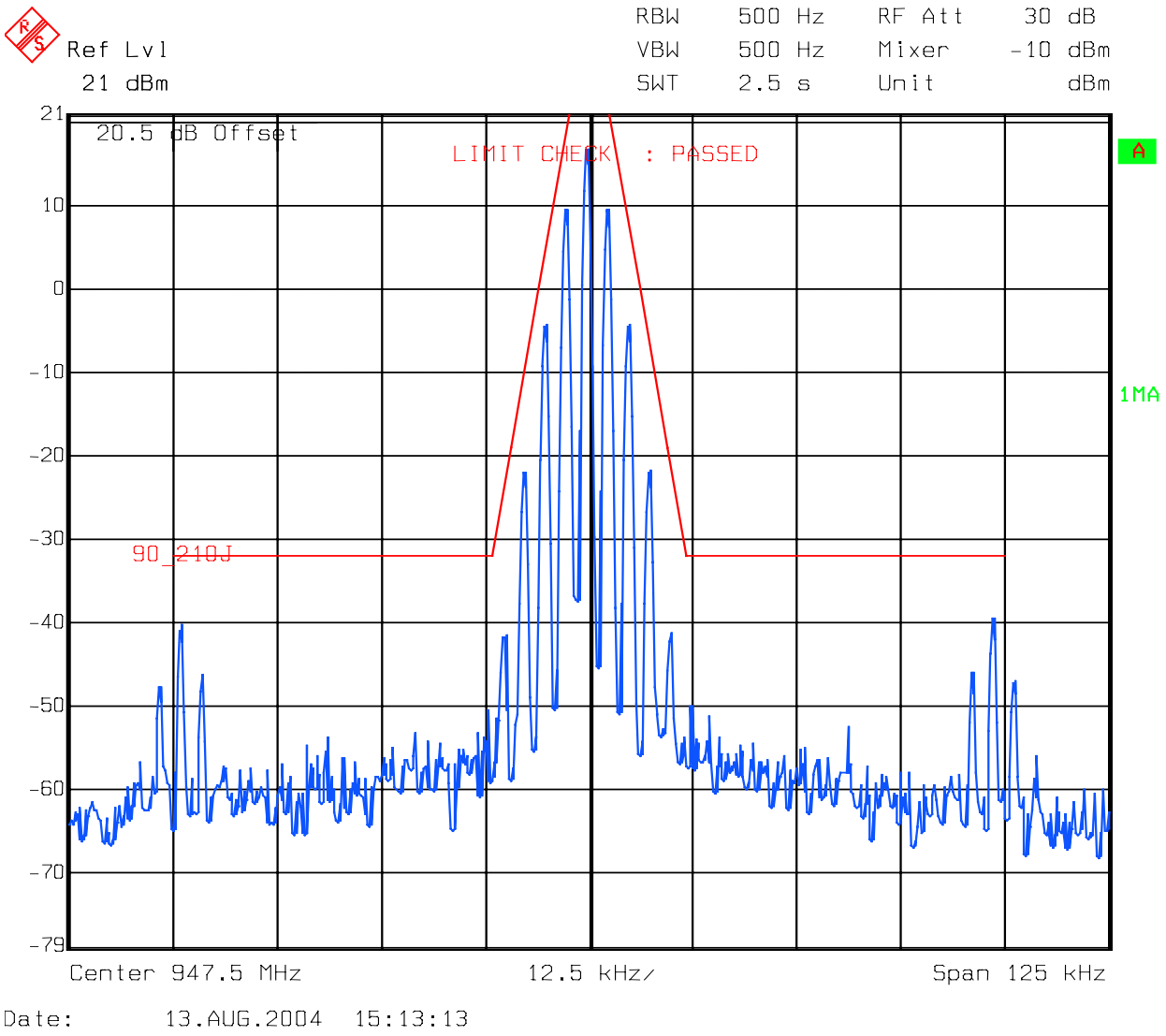
ANALOG 800Band, Mask G



ANALOG 800Band, Mask H



ANALOG 900Band, Mask J



Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.991
TESTED BY: Dustin Oaks	DATE: 07/28/2004

Test Results: Complies

Test Data: See attached graph(s).

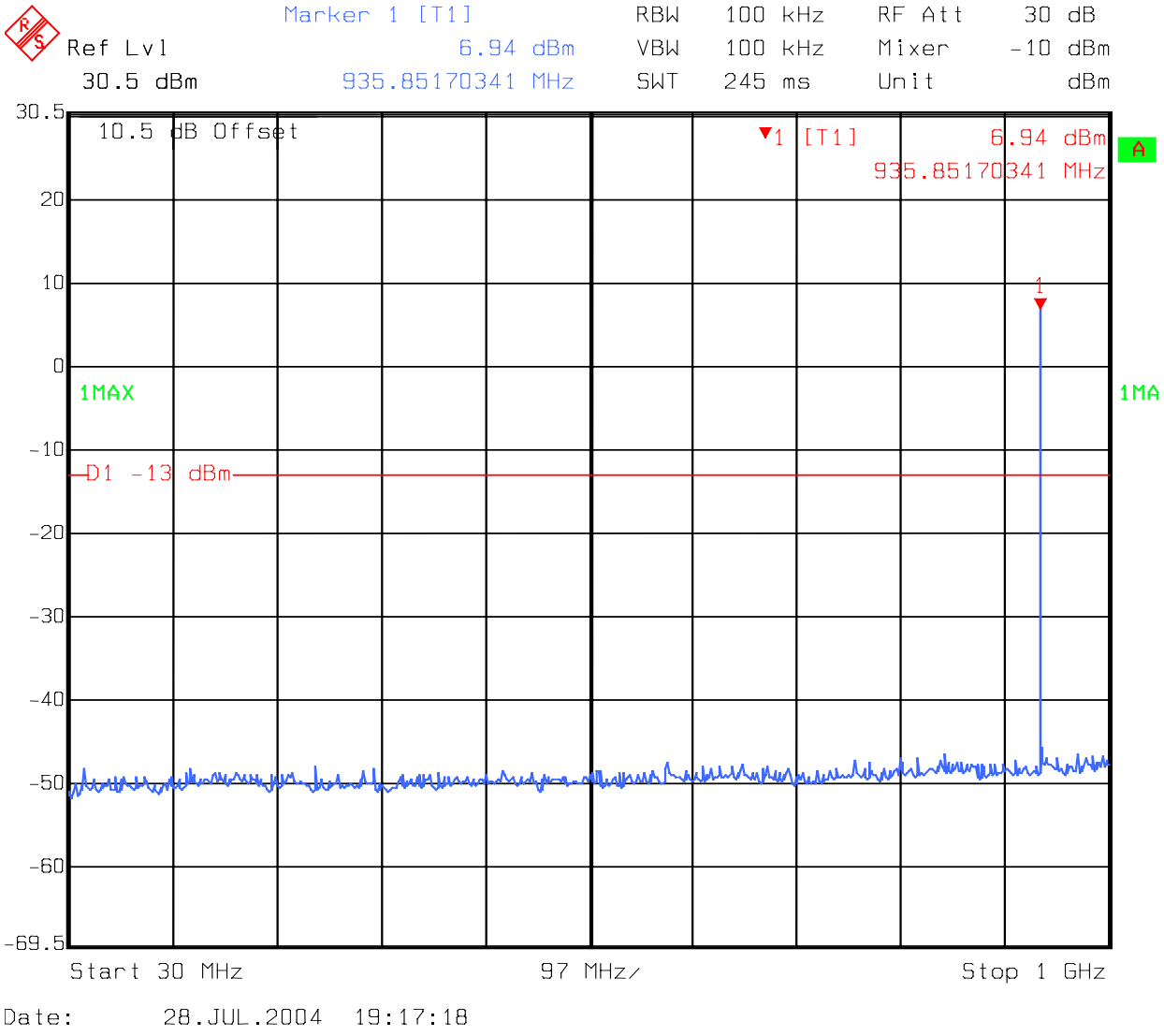
Equipment Used: 1036, 1053, 1627, 1471, 1973, 1092

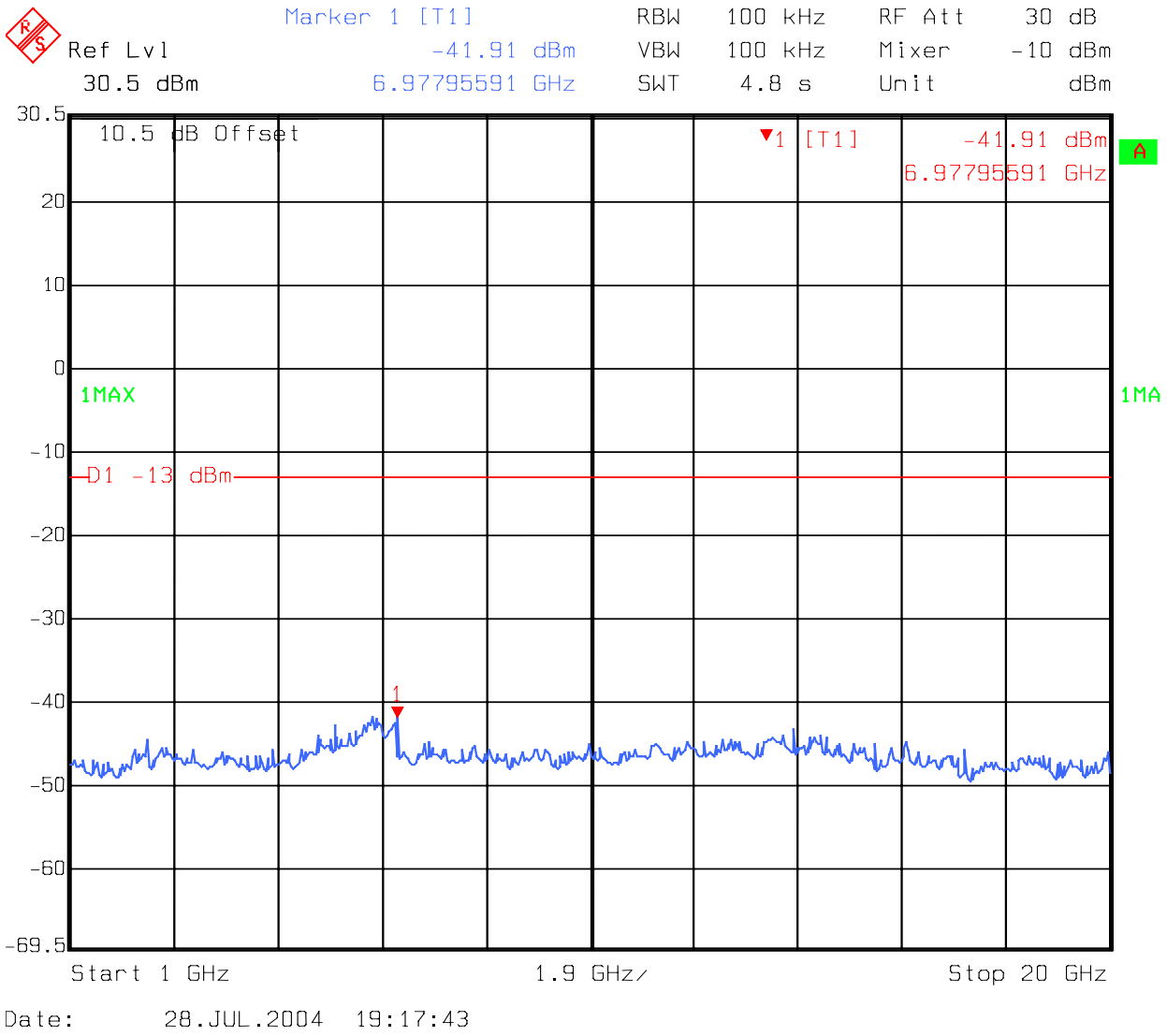
Measurement Uncertainty: +/- 1.6 dB

Temperature: 21 °C

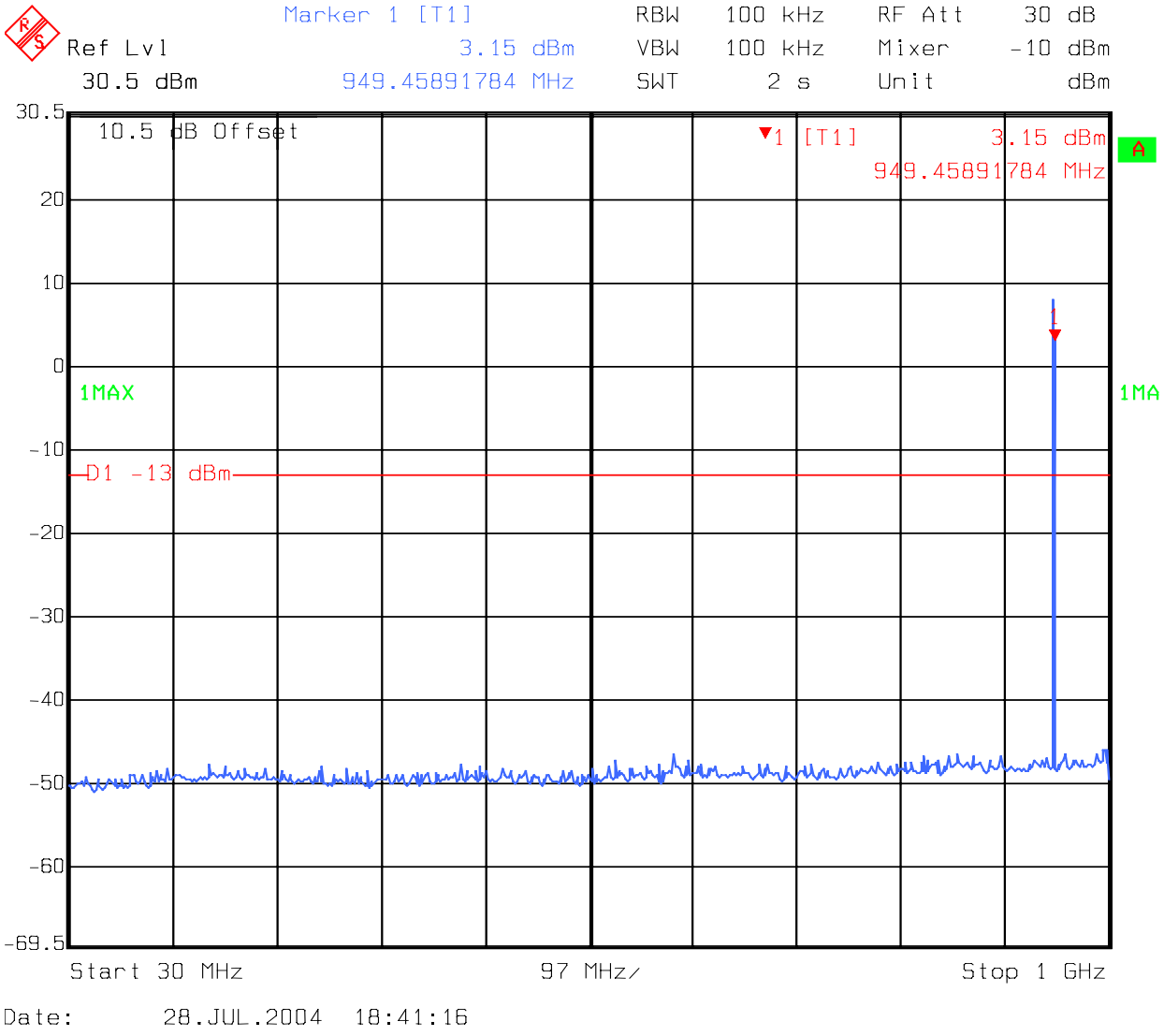
Relative Humidity: 51 %

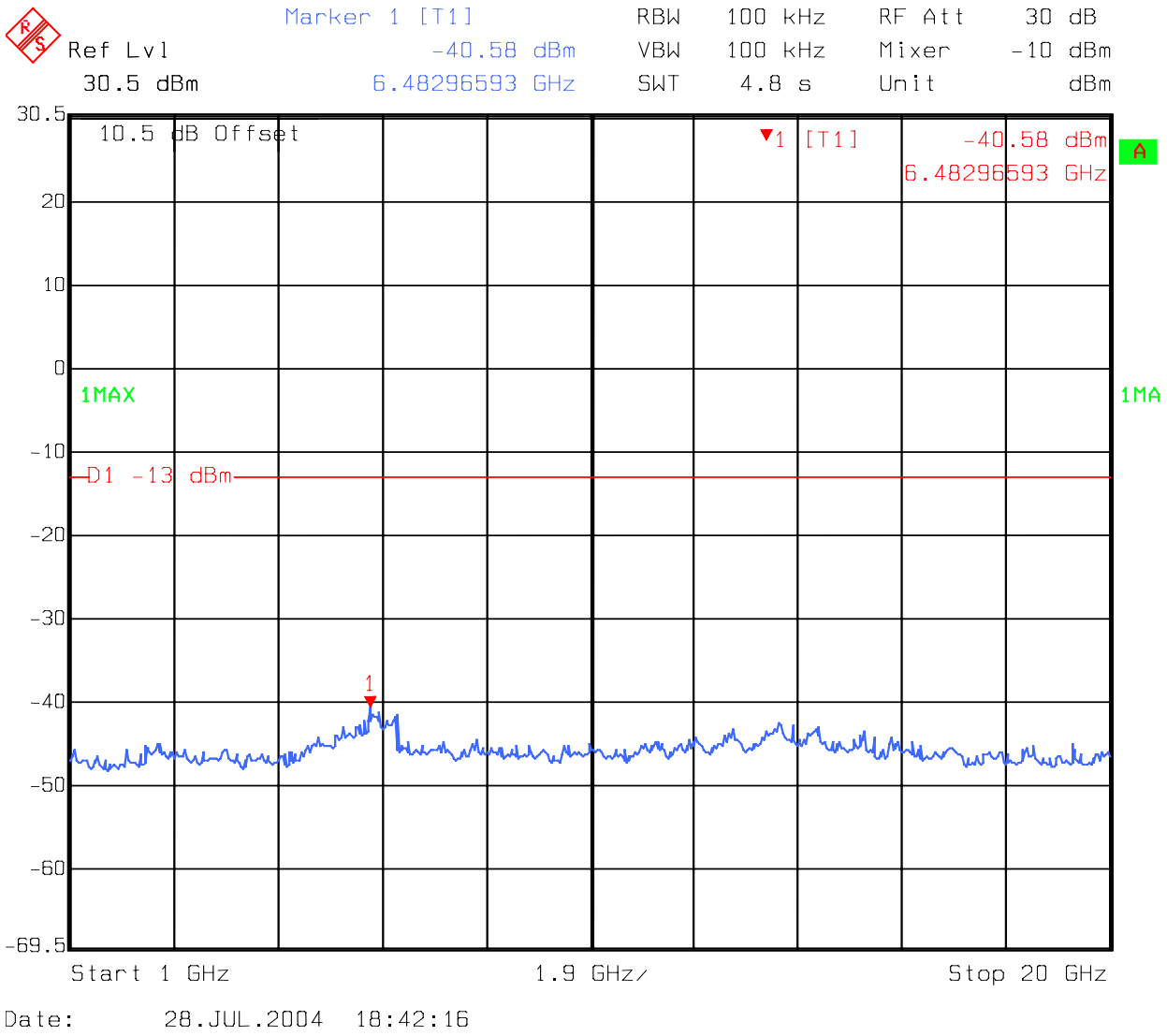
Low Channel iDEN



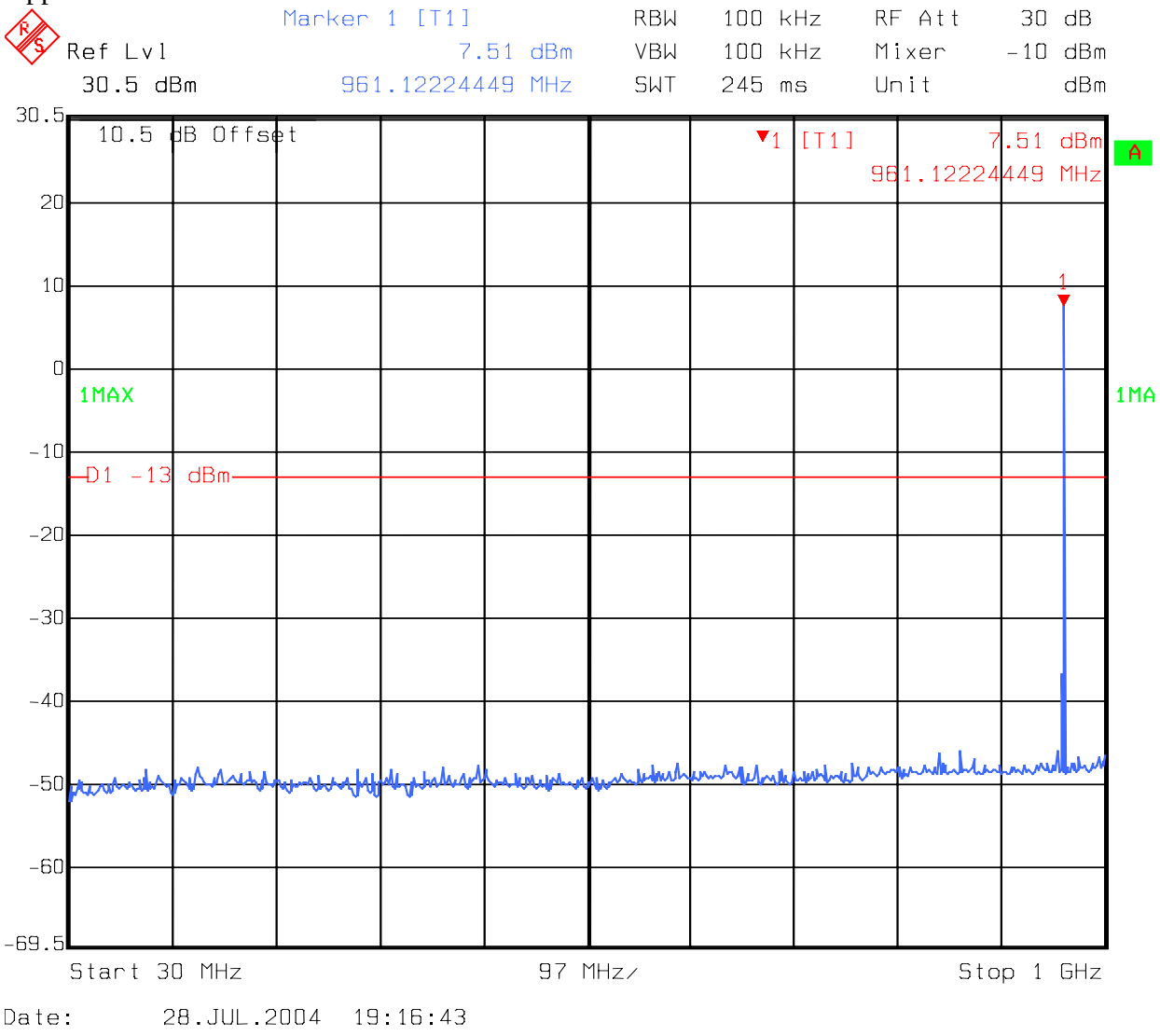

Marker 1 [T1]
Ref Lvl
30.5 dBm
-41.91 dBm
6.97795591 GHz
RBW 100 kHz
VBW 100 kHz
SWT 4.8 s
RF Att 30 dB
Mixer -10 dBm
Unit dBm
10.5 dB Offset
1 [T1]
-41.91 dBm
6.97795591 GHz
A
1MAX
1MA
D1 -13 dBm
30.5
20
10
0
-10
-20
-30
-40
-50
-60
-69.5
Start 1 GHz
1.9 GHz/
Stop 20 GHz
Date: 28.JUL.2004 19:17:43

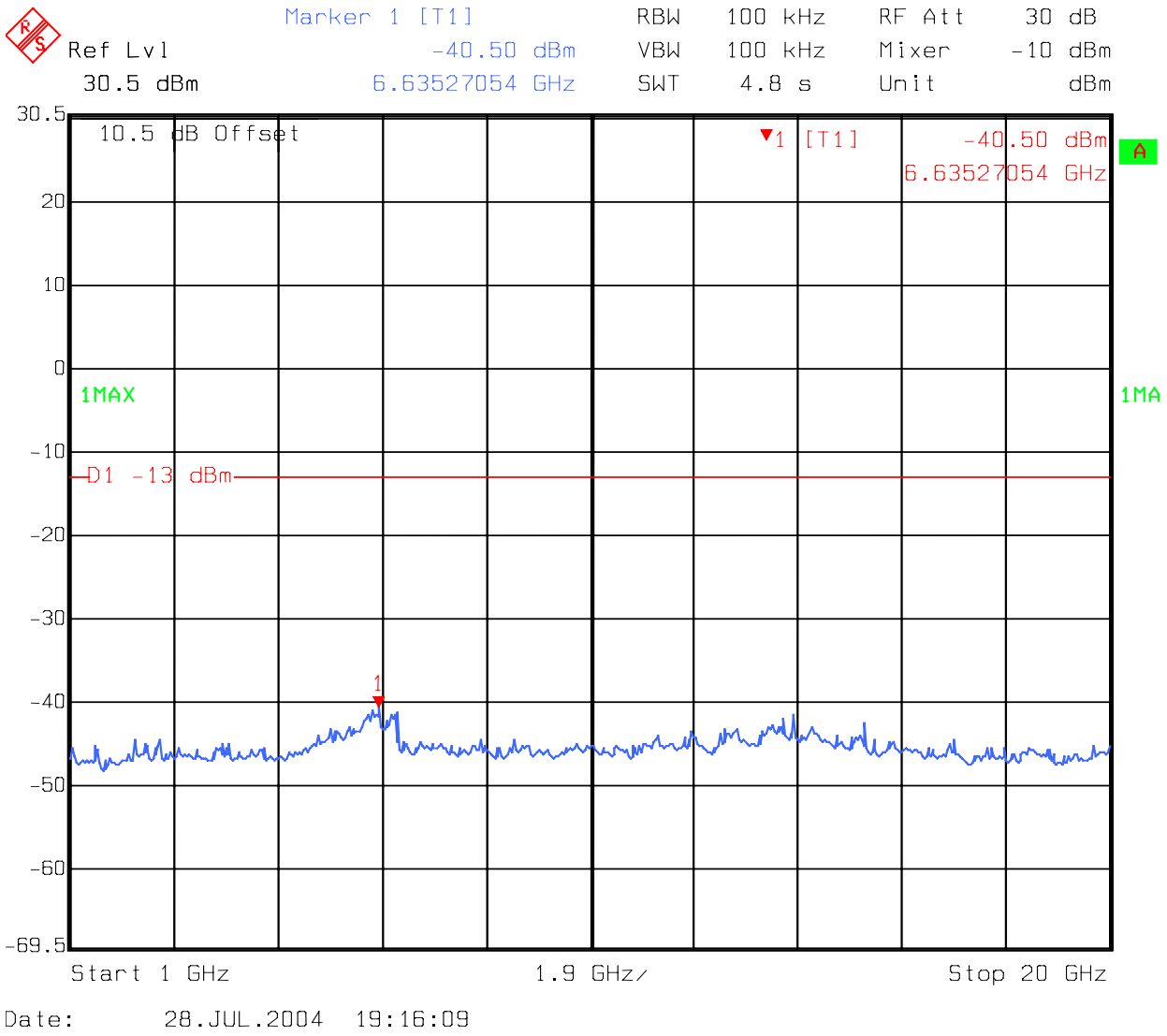
Mid Channel iDEN



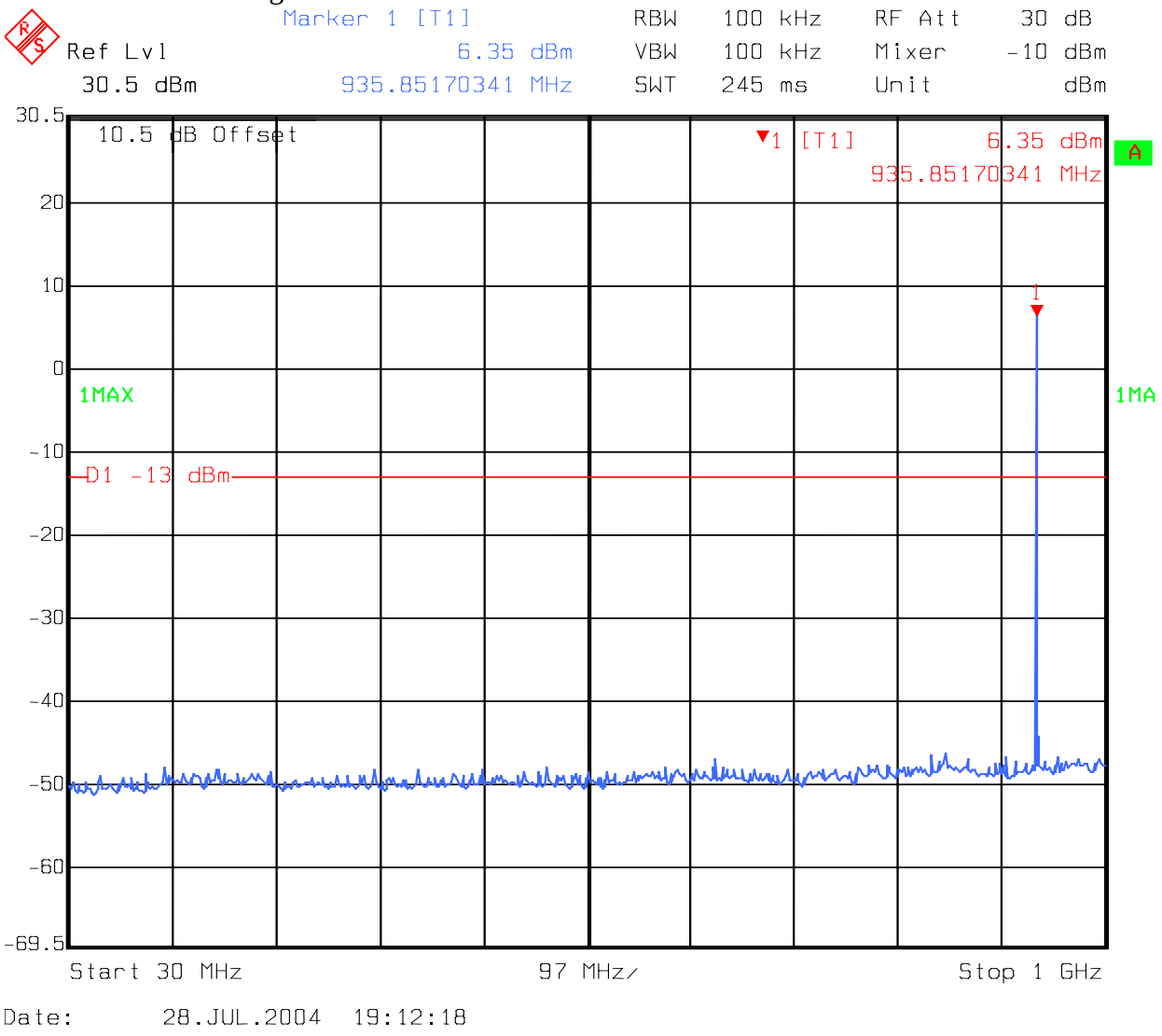

Marker 1 [T1]
Ref Lvl
30.5 dBm
-40.58 dBm
6.48296593 GHz
RBW 100 kHz
VBW 100 kHz
SWT 4.8 s
RF Att 30 dB
Mixer -10 dBm
Unit dBm
10.5 dB Offset
1 [T1]
-40.58 dBm
6.48296593 GHz
A
1MAX
1MA
D1 -13 dBm
30.5
20
10
0
-10
-20
-30
-40
-50
-60
-69.5
Start 1 GHz
1.9 GHz/
Stop 20 GHz
Date: 28.JUL.2004 18:42:16

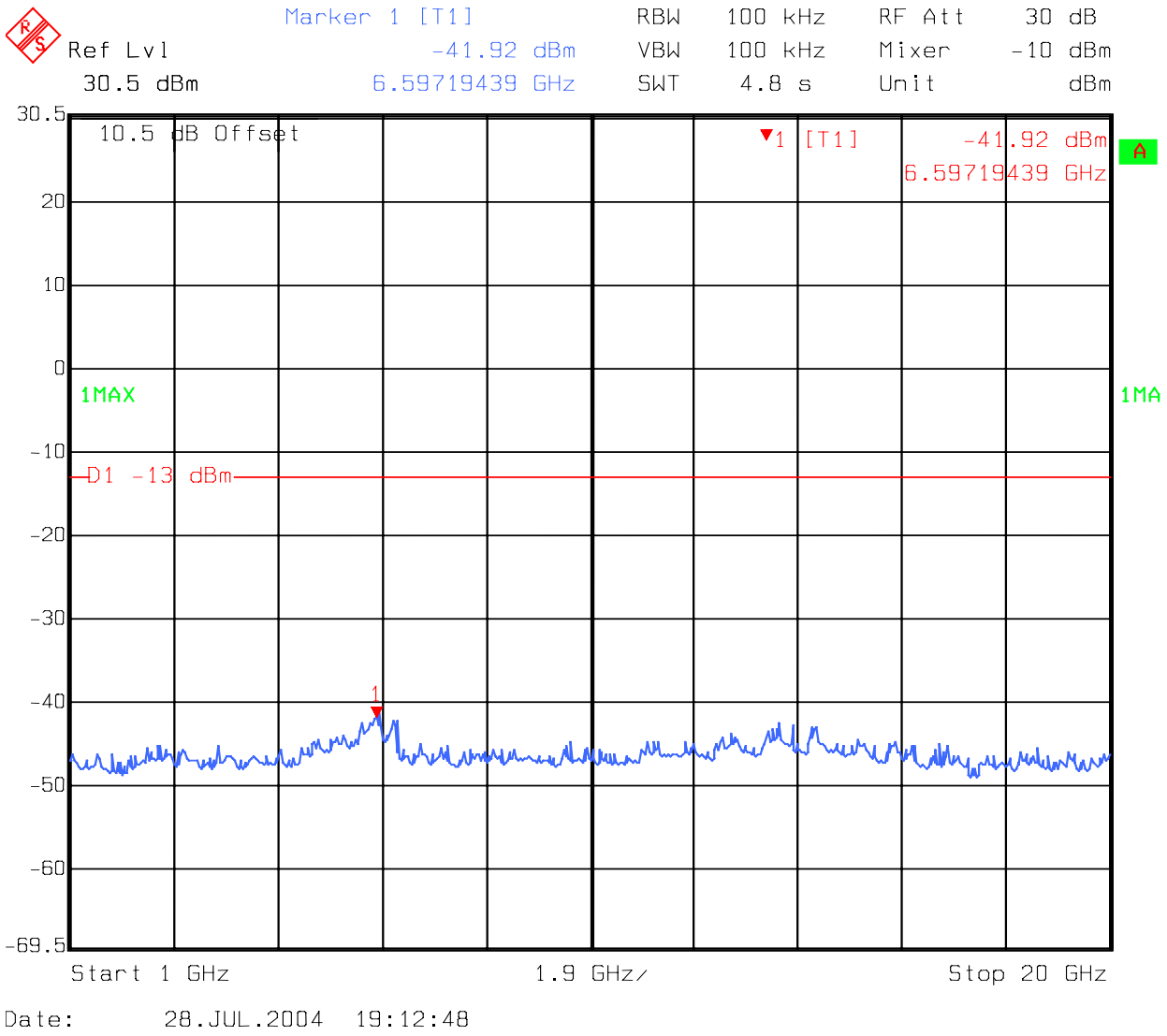
Upper Channel iDEN



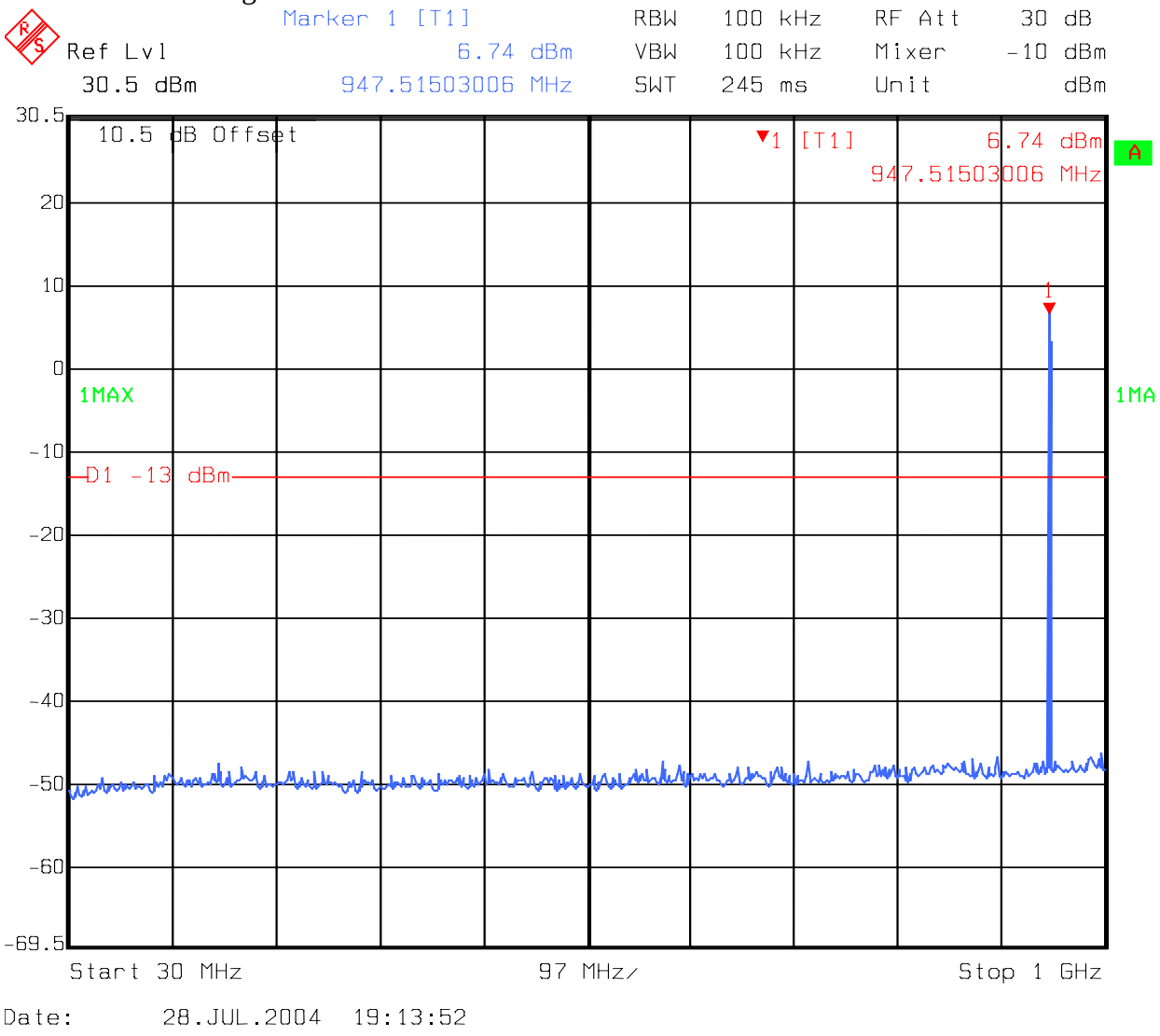

Marker 1 [T1]
Ref Lvl
30.5 dBm
-40.50 dBm
6.63527054 GHz
RBW 100 kHz
VBW 100 kHz
SWT 4.8 s
RF Att 30 dB
Mixer -10 dBm
Unit dBm
10.5 dB Offset
1 [T1]
-40.50 dBm
6.63527054 GHz
A
1MAX
1MA
D1 -13 dBm
30.5
20
10
0
-10
-20
-30
-40
-50
-60
-69.5
Start 1 GHz
1.9 GHz/
Stop 20 GHz
Date: 28.JUL.2004 19:16:09

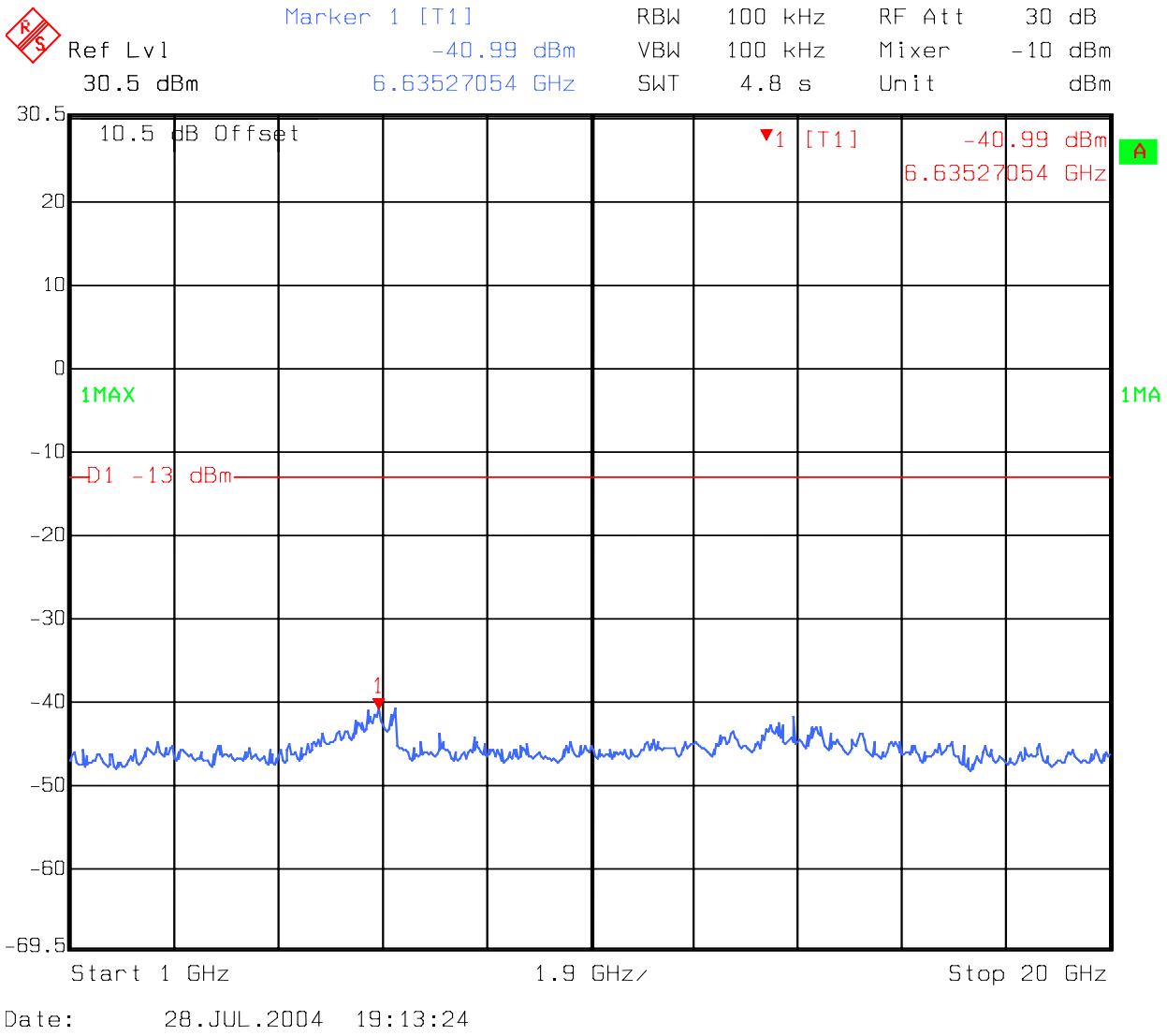
Lower Channel Analog



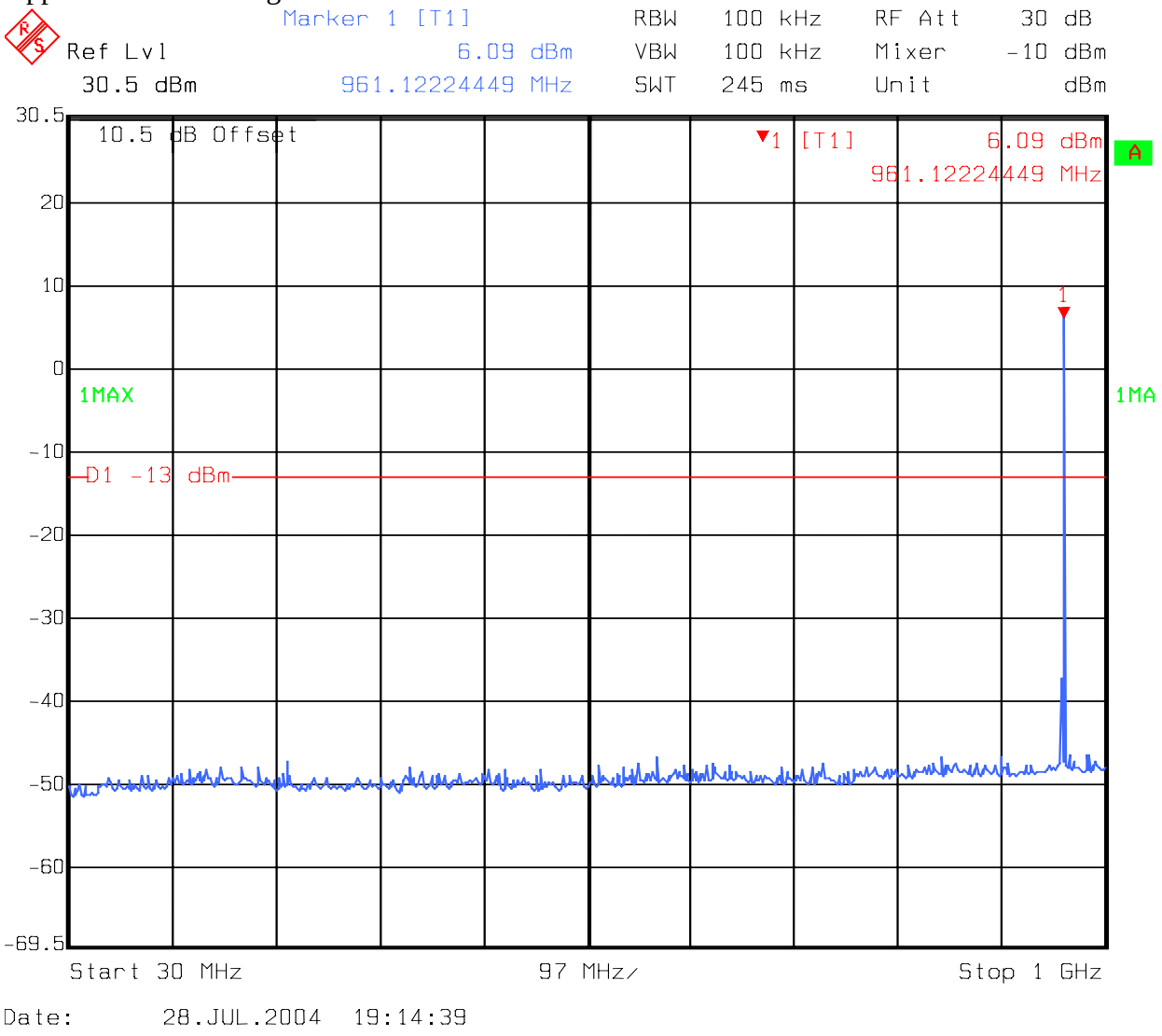

Marker 1 [T1]
Ref Lvl
30.5 dBm
-41.92 dBm
6.59719439 GHz
RBW 100 kHz
VBW 100 kHz
SWT 4.8 s
RF Att 30 dB
Mixer -10 dBm
Unit dBm
10.5 dB Offset
1 [T1]
-41.92 dBm
6.59719439 GHz
A
1MAX
1MA
D1 -13 dBm
30.5
20
10
0
-10
-20
-30
-40
-50
-60
-69.5
Start 1 GHz
1.9 GHz/
Stop 20 GHz
Date: 28.JUL.2004 19:12:48

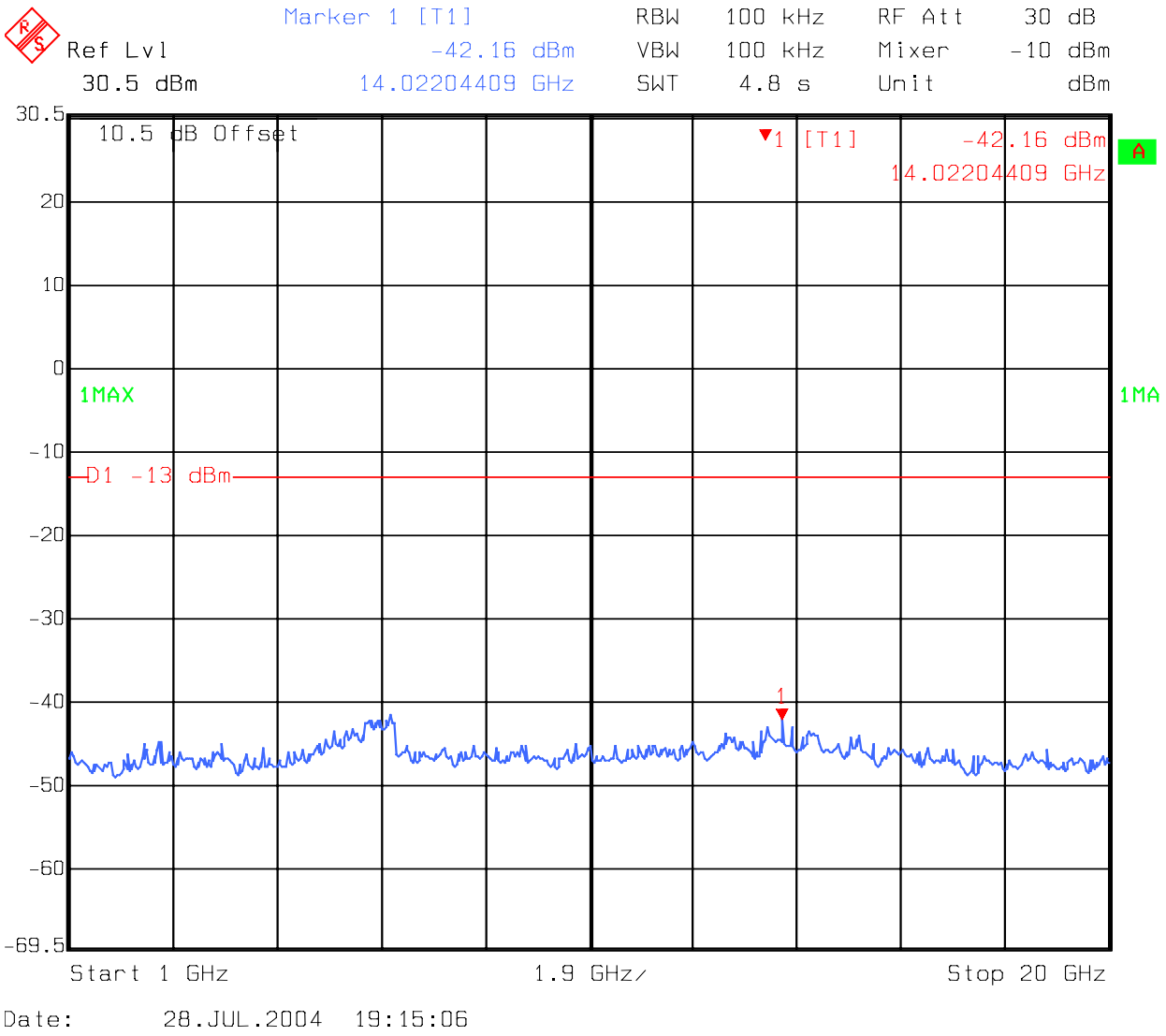
Mid Channel Analog




Marker 1 [T1]
Ref Lvl
30.5 dBm
-40.99 dBm
6.63527054 GHz
RBW 100 kHz
VBW 100 kHz
SWT 4.8 s
RF Att 30 dB
Mixer -10 dBm
Unit dBm
10.5 dB Offset
1 [T1]
-40.99 dBm
6.63527054 GHz
A
1MAX
1MA
D1 -13 dBm
30.5
20
10
0
-10
-20
-30
-40
-50
-60
-69.5
Start 1 GHz
1.9 GHz/
Stop 20 GHz
Date: 28.JUL.2004 19:13:24

Upper Channel Analog

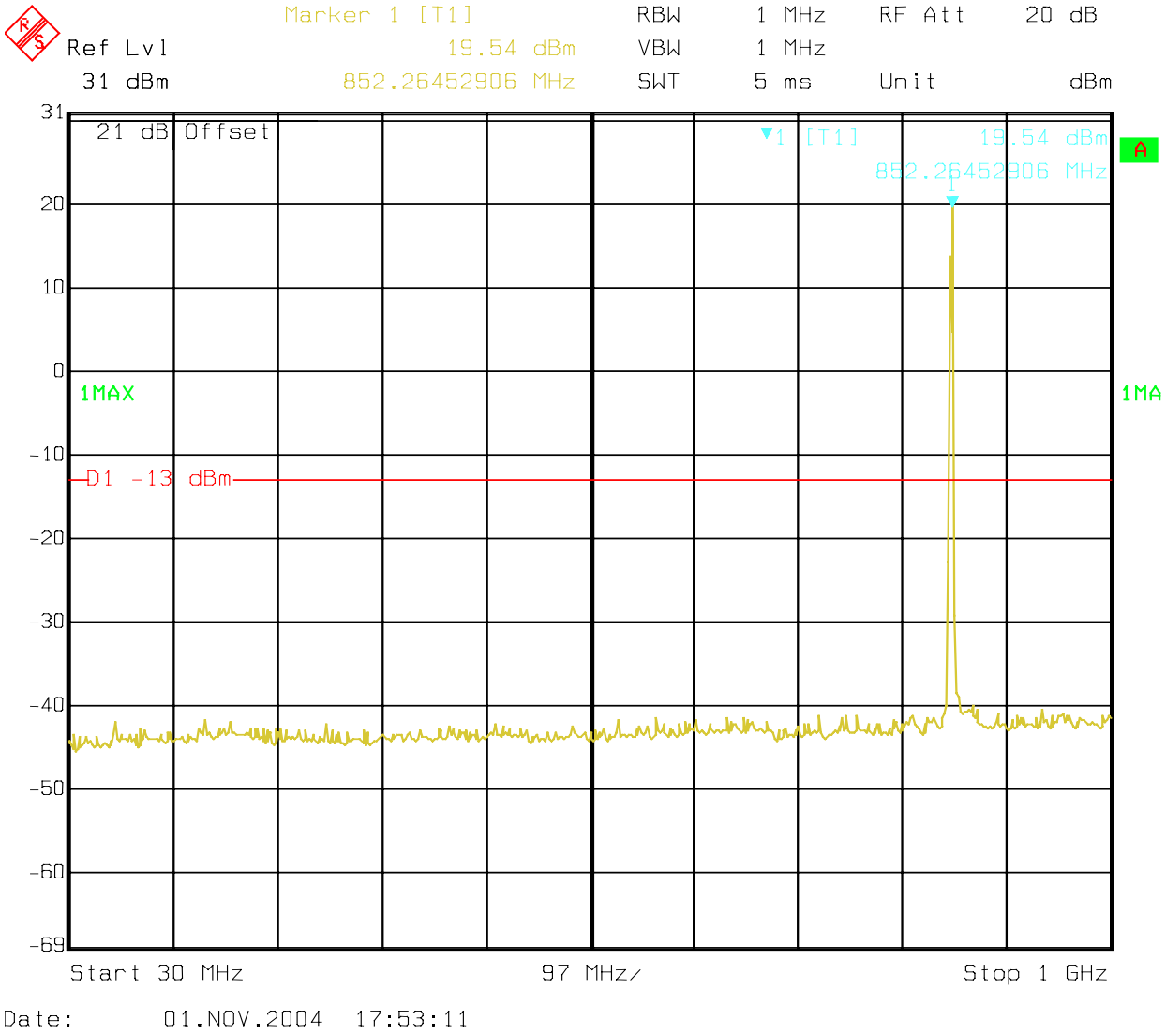


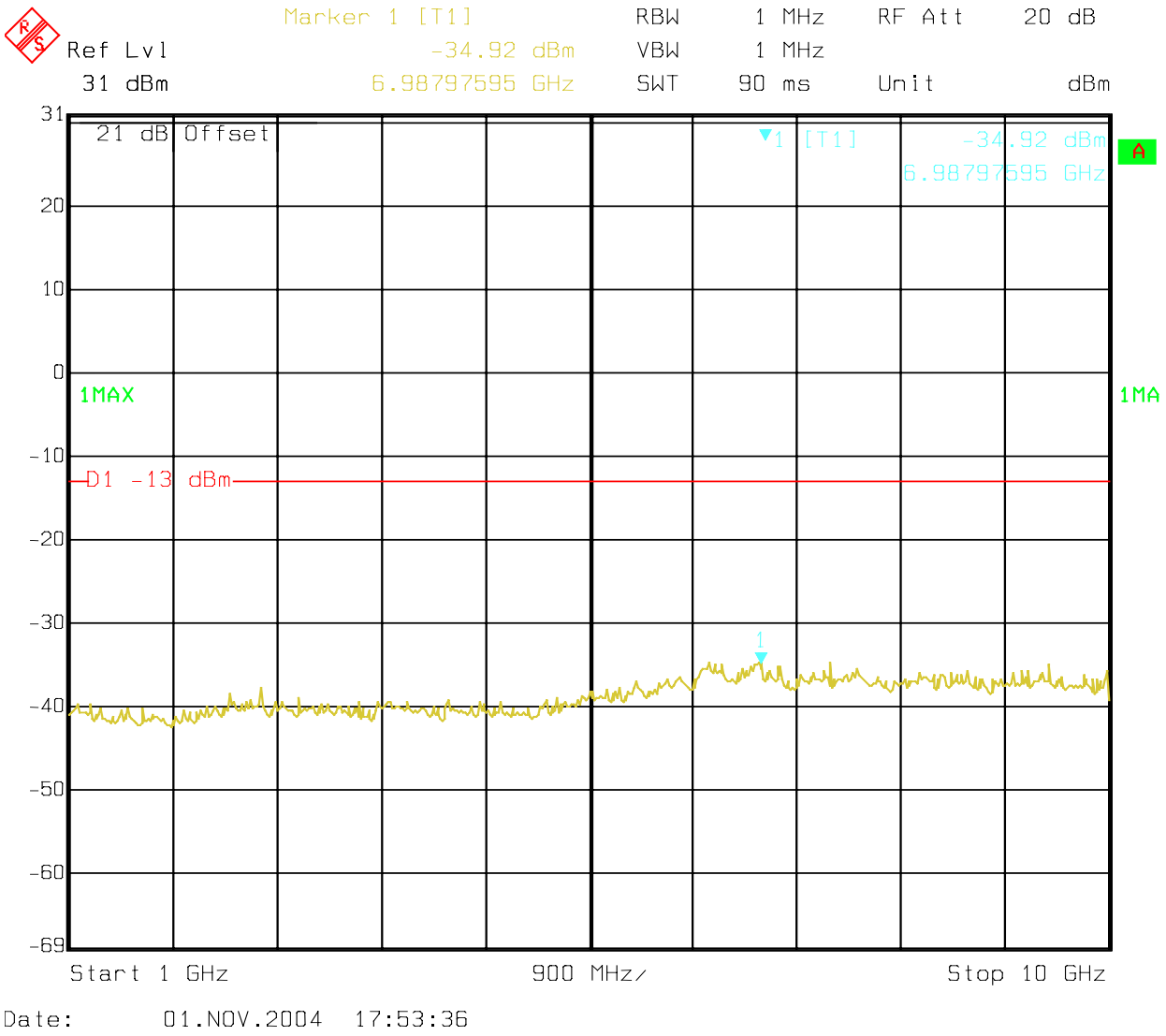

Marker 1 [T1]
Ref Lvl
30.5 dBm
-42.16 dBm
14.02204409 GHz
RBW 100 kHz
VBW 100 kHz
SWT 4.8 s
RF Att 30 dB
Mixer -10 dBm
Unit dBm
10.5 dB Offset
1 [T1]
-42.16 dBm
14.02204409 GHz
A
1MAX
1MA
D1 -13 dBm
30.5
20
10
0
-10
-20
-30
-40
-50
-60
-69.5
Start 1 GHz
1.9 GHz/
Stop 20 GHz
Date: 28.JUL.2004 19:15:06

800MHz Band Conducted Emissions

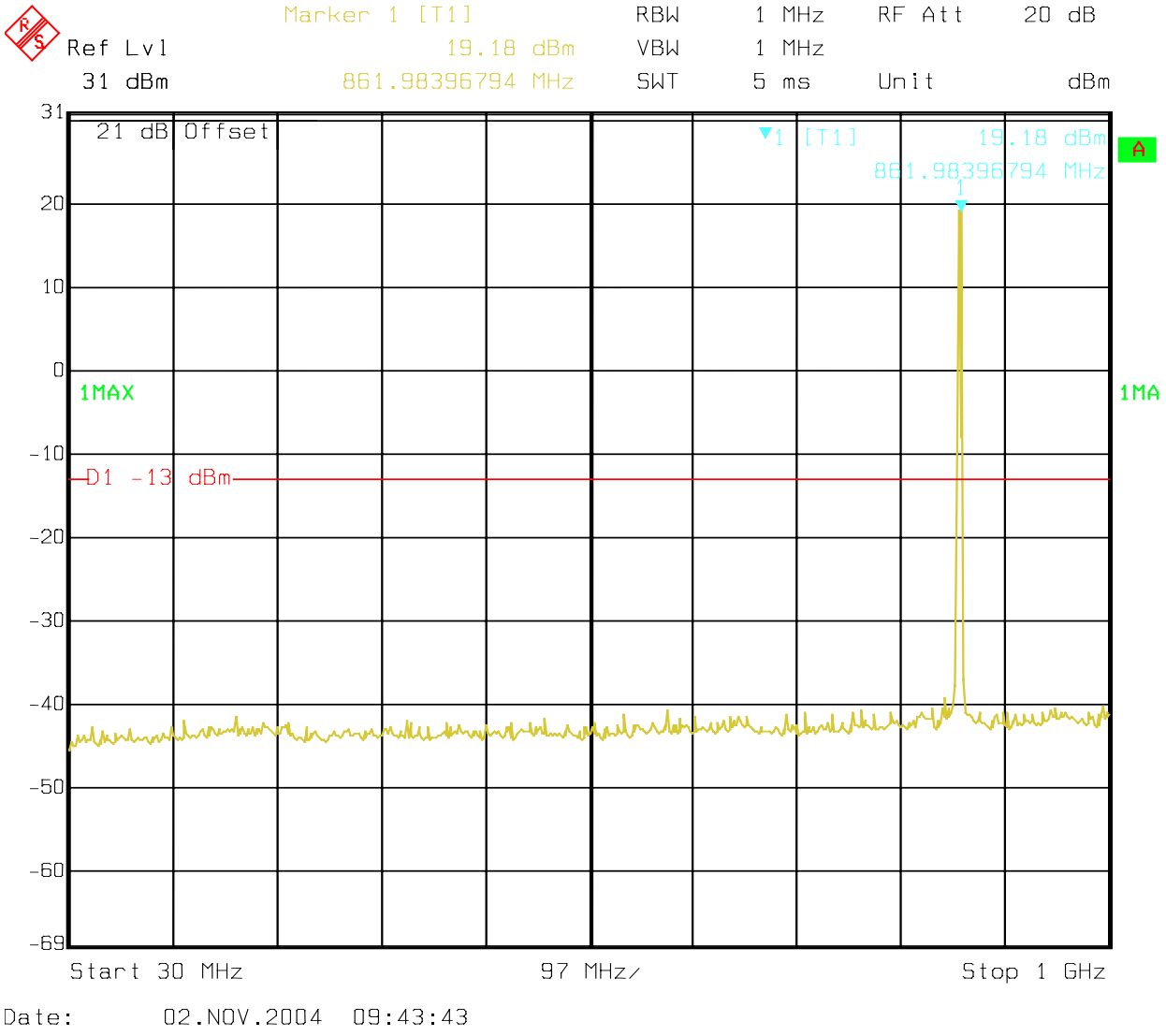
800MHz Band Analog Modulation

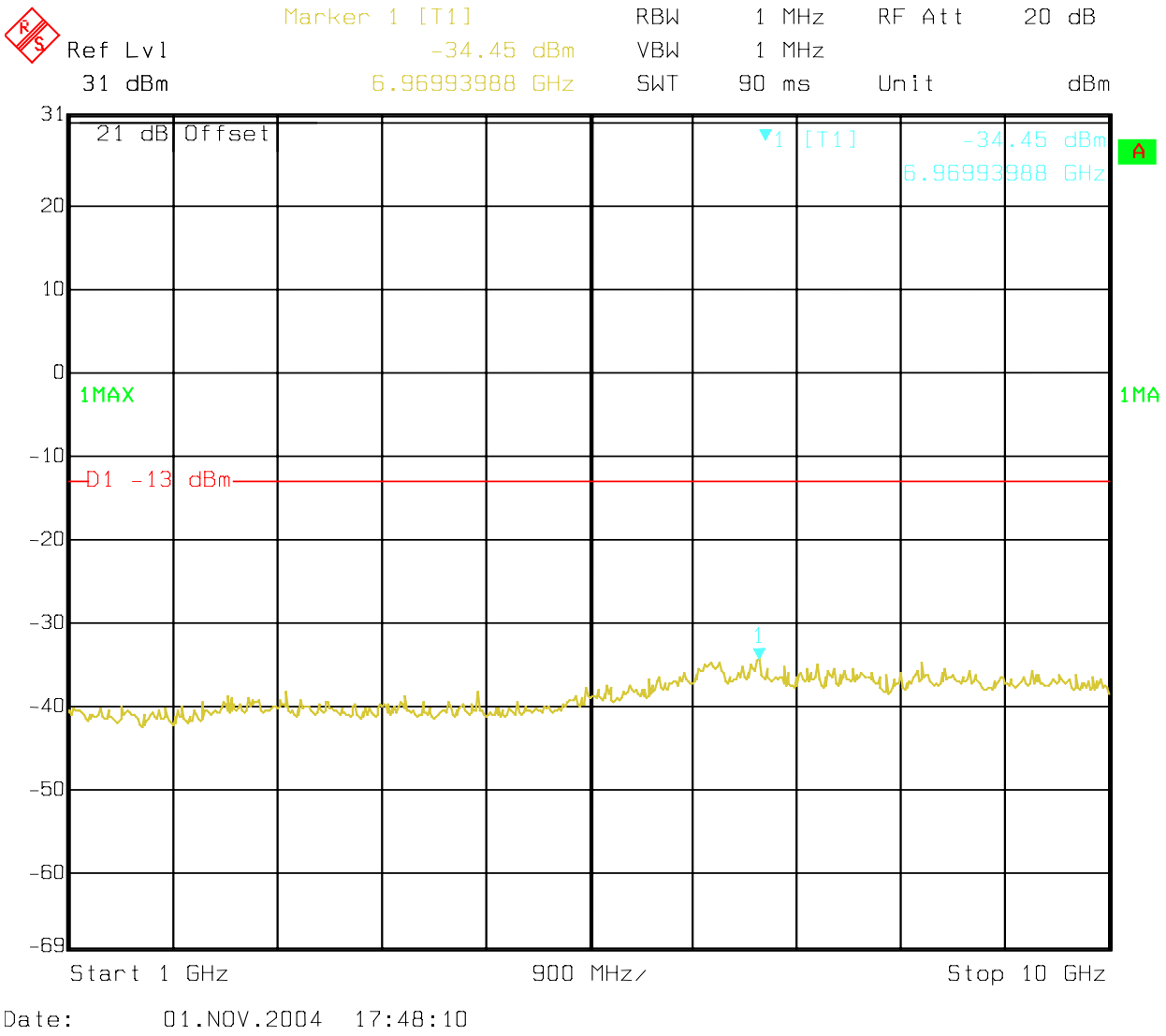
Low Channel



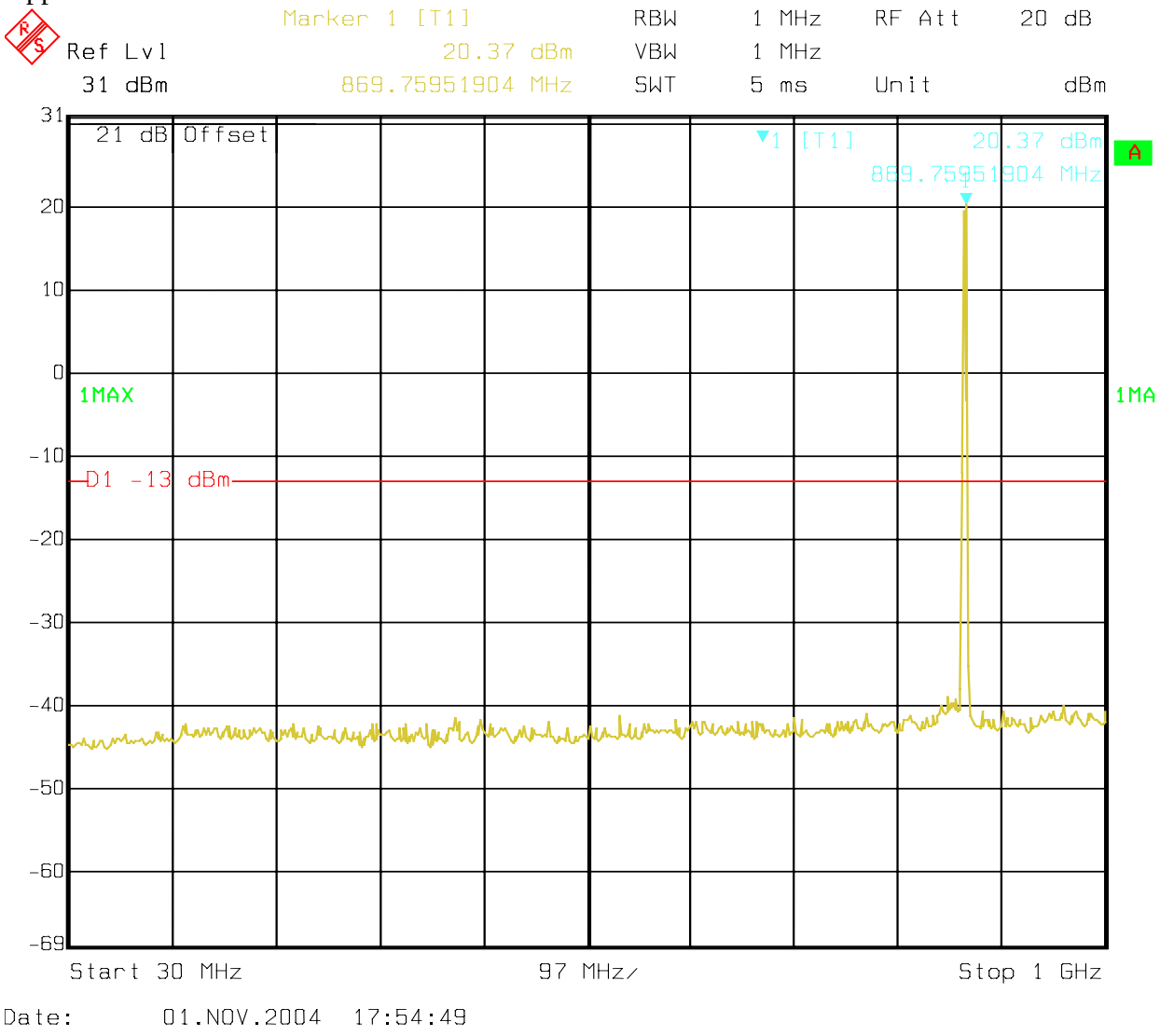

Marker 1 [T1]
Ref Lvl
31 dBm
-34.92 dBm
6.98797595 GHz
RBW 1 MHz
VBW 1 MHz
SWT 90 ms
RF Att 20 dB
Unit dBm
21 dB Offset
1 [T1]
-34.92 dBm
6.98797595 GHz
A
1MAX
1MA
D1 -13 dBm
31
20
10
0
-10
-20
-30
-40
-50
-60
-69
Start 1 GHz
900 MHz/
Stop 10 GHz
Date: 01.NOV.2004 17:53:36

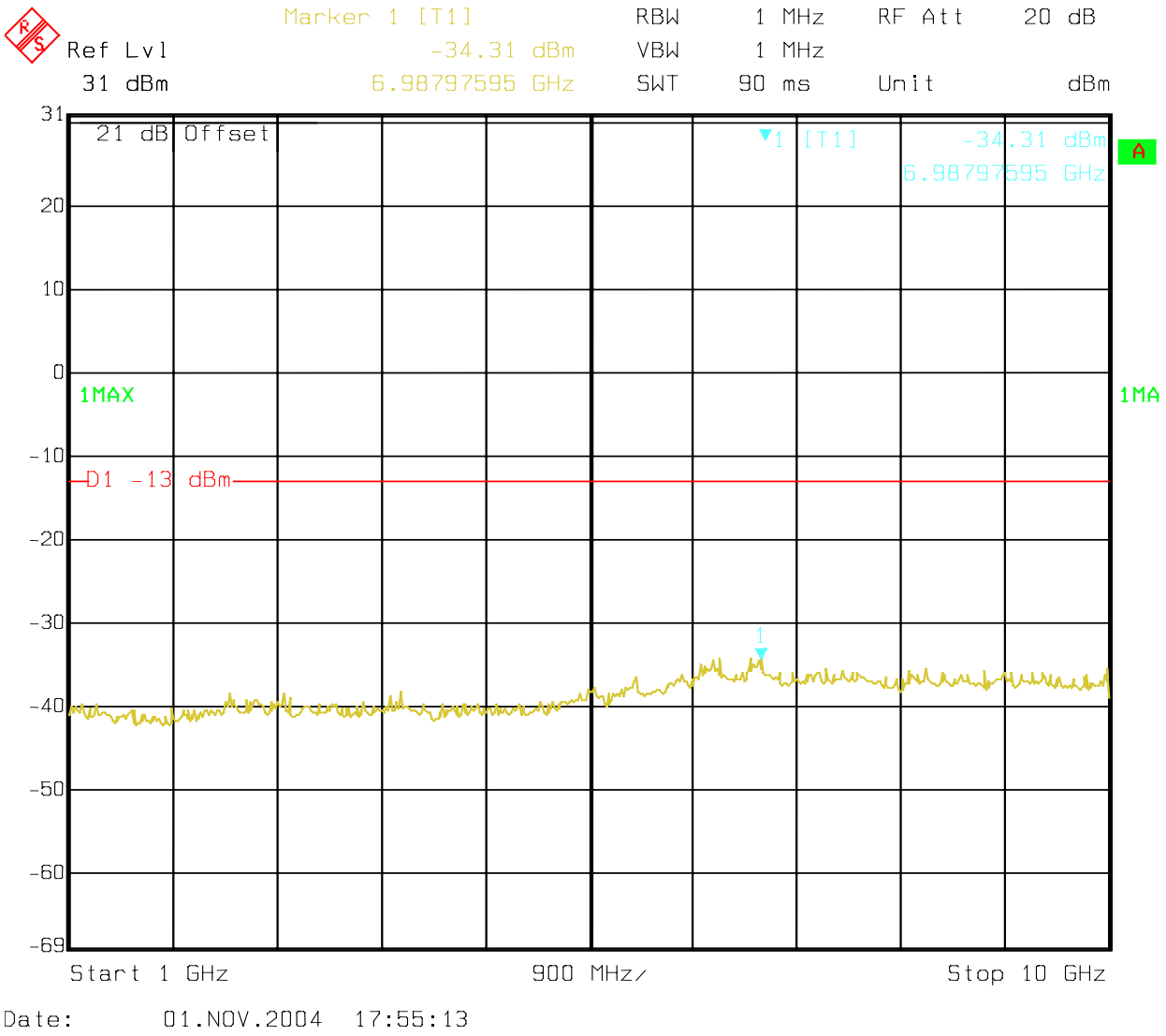
Mid Channel


Marker 1 [T1]
RBW 1 MHz
RF Att 20 dB
Ref Lvl
19.18 dBm
VBW 1 MHz
31 dBm
861.98396794 MHz
SWT 5 ms
Unit dBm
21 dB Offset
1 [T1]
19.18 dBm
861.98396794 MHz
1MAX
1MA
D1 -13 dBm
Start 30 MHz
97 MHz/
Stop 1 GHz
Date: 02.NOV.2004 09:43:43

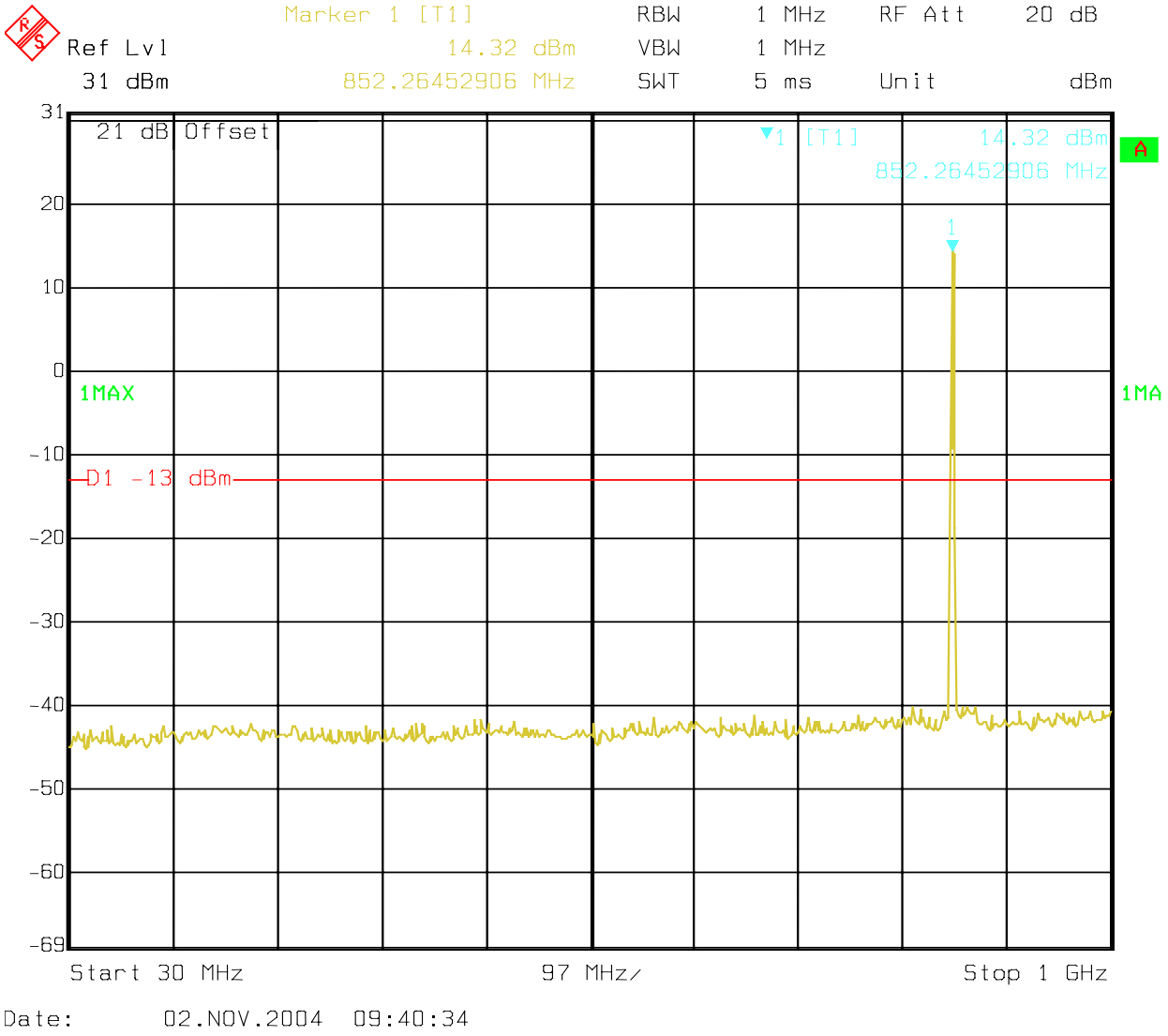

Marker 1 [T1]
Ref Lvl
31 dBm
-34.45 dBm
6.96993988 GHz
RBW 1 MHz
VBW 1 MHz
SWT 90 ms
RF Att 20 dB
Unit dBm
21 dB Offset
1 [T1]
-34.45 dBm
6.96993988 GHz
1MAX
1MA
D1 -13 dBm
Start 1 GHz
900 MHz/
Stop 10 GHz
Date: 01.NOV.2004 17:48:10

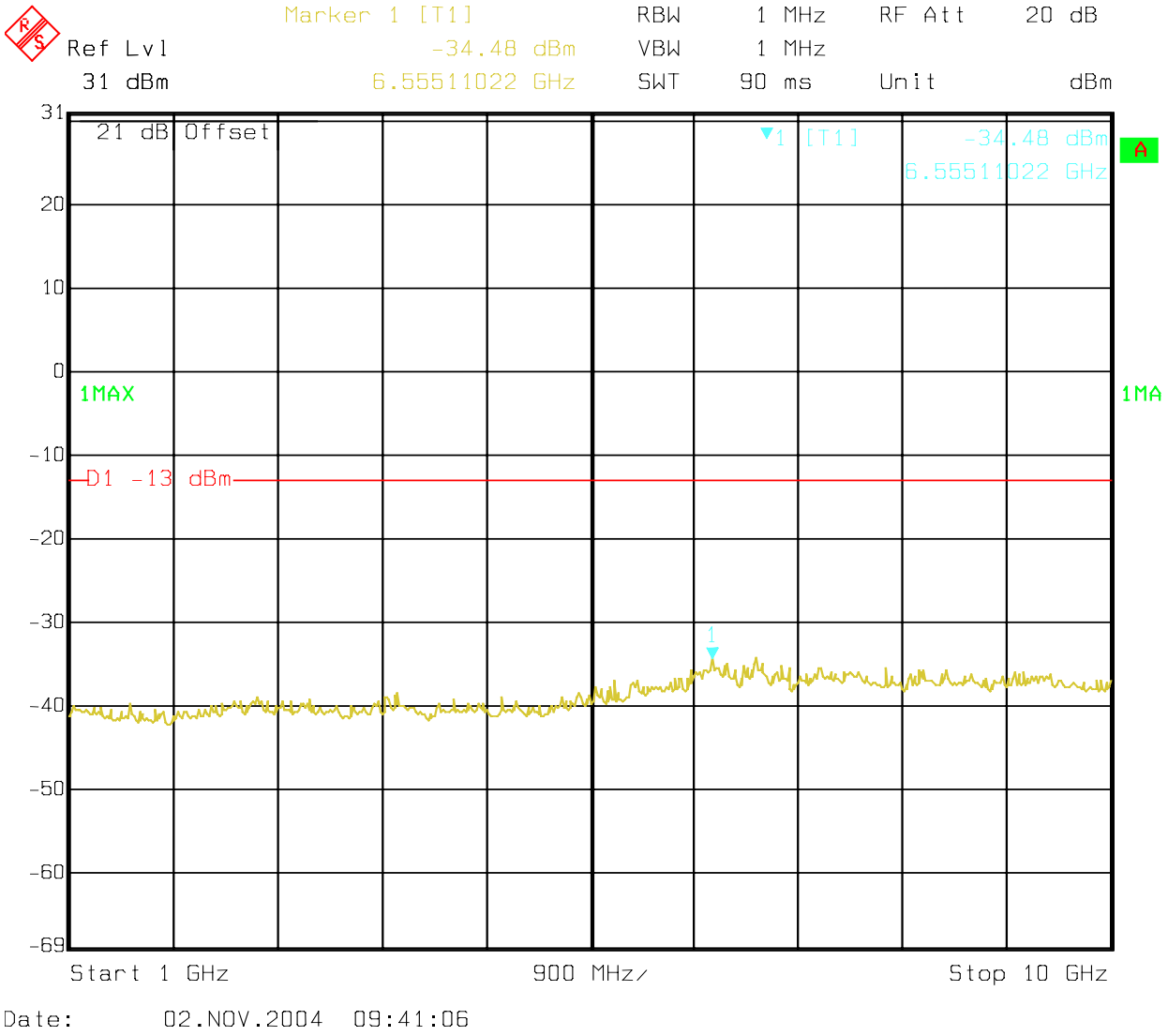
Upper Channel



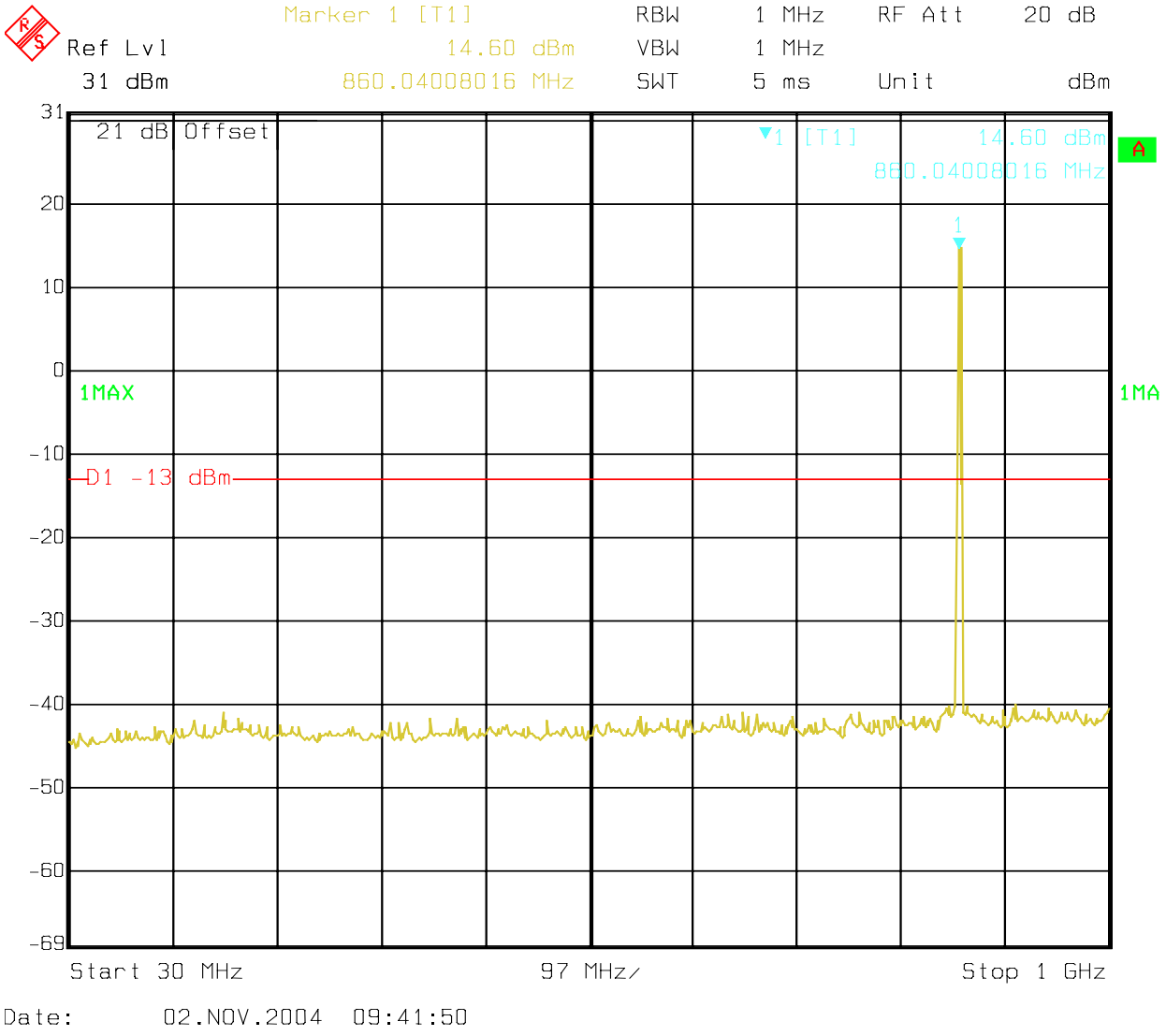

Marker 1 [T1]
RBW 1 MHz
RF Att 20 dB
Ref Lvl
-34.31 dBm
VBW 1 MHz
31 dBm
6.98797595 GHz
SWT 90 ms
Unit dBm
21 dB Offset
1 [T1]
-34.31 dBm
6.98797595 GHz
A
1MAX
1MA
D1 -13 dBm
Start 1 GHz
900 MHz/
Stop 10 GHz
Date: 01.NOV.2004 17:55:13

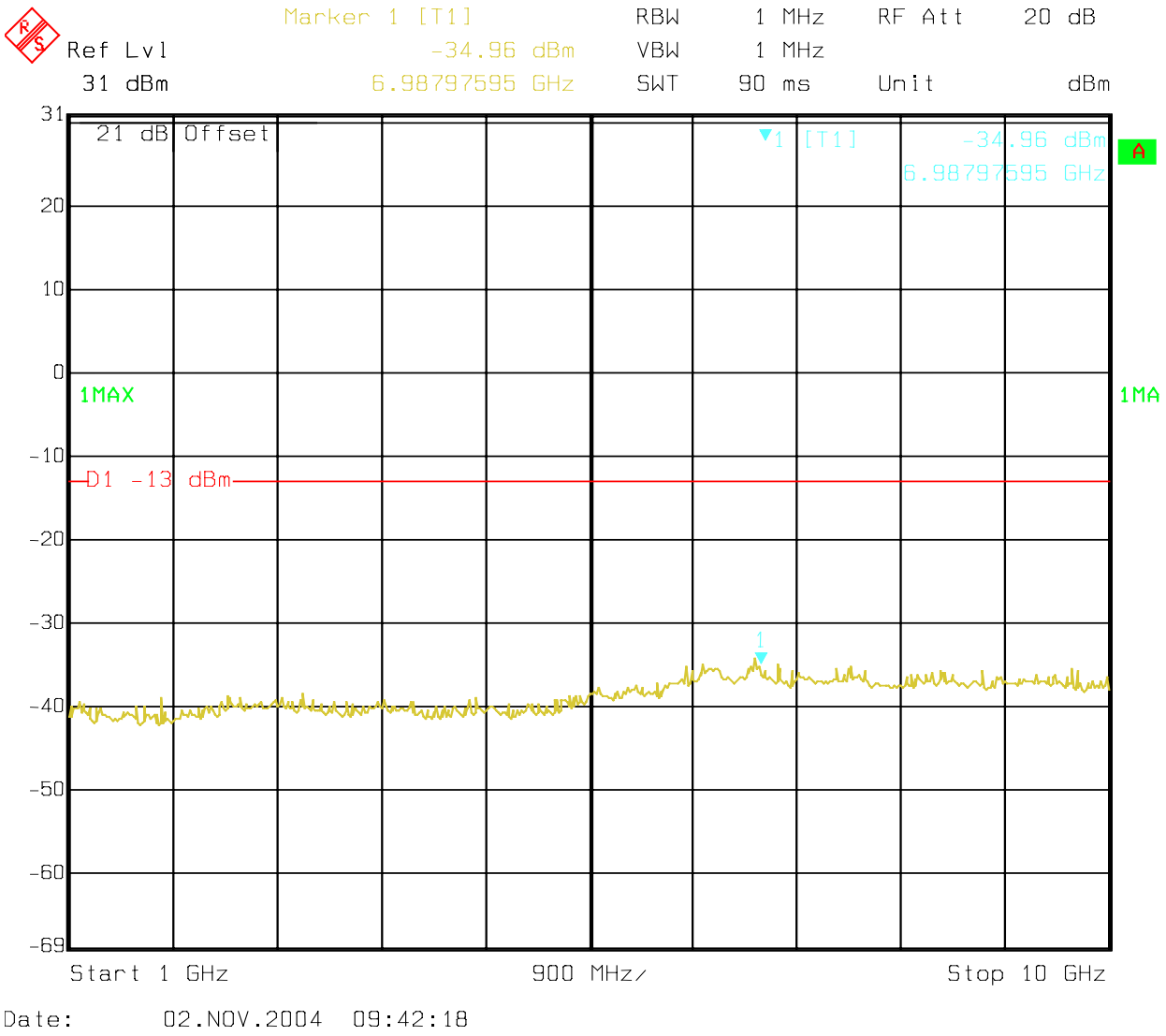
800MHz Band iDEN Modulation
Lower Channel



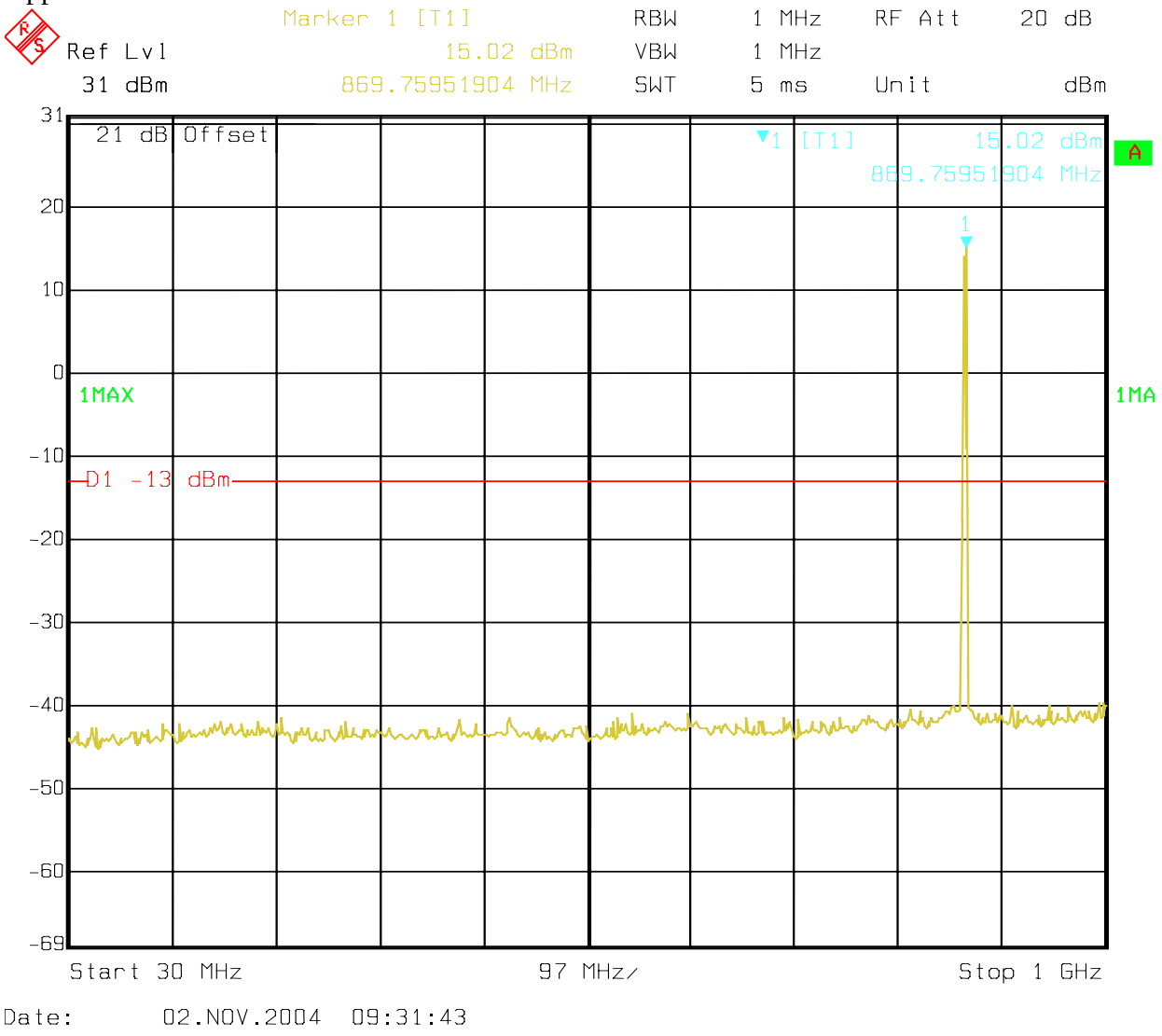

Marker 1 [T1]
RBW 1 MHz
RF Att 20 dB
Ref Lvl
-34.48 dBm
VBW 1 MHz
31 dBm
6.55511022 GHz
SWT 90 ms
Unit dBm
21 dB Offset
1 [T1]
-34.48 dBm
6.55511022 GHz
A
1MAX
1MA
D1 -13 dBm
31
20
10
0
-10
-20
-30
-40
-50
-60
-69
Start 1 GHz
900 MHz/
Stop 10 GHz
Date: 02.NOV.2004 09:41:06

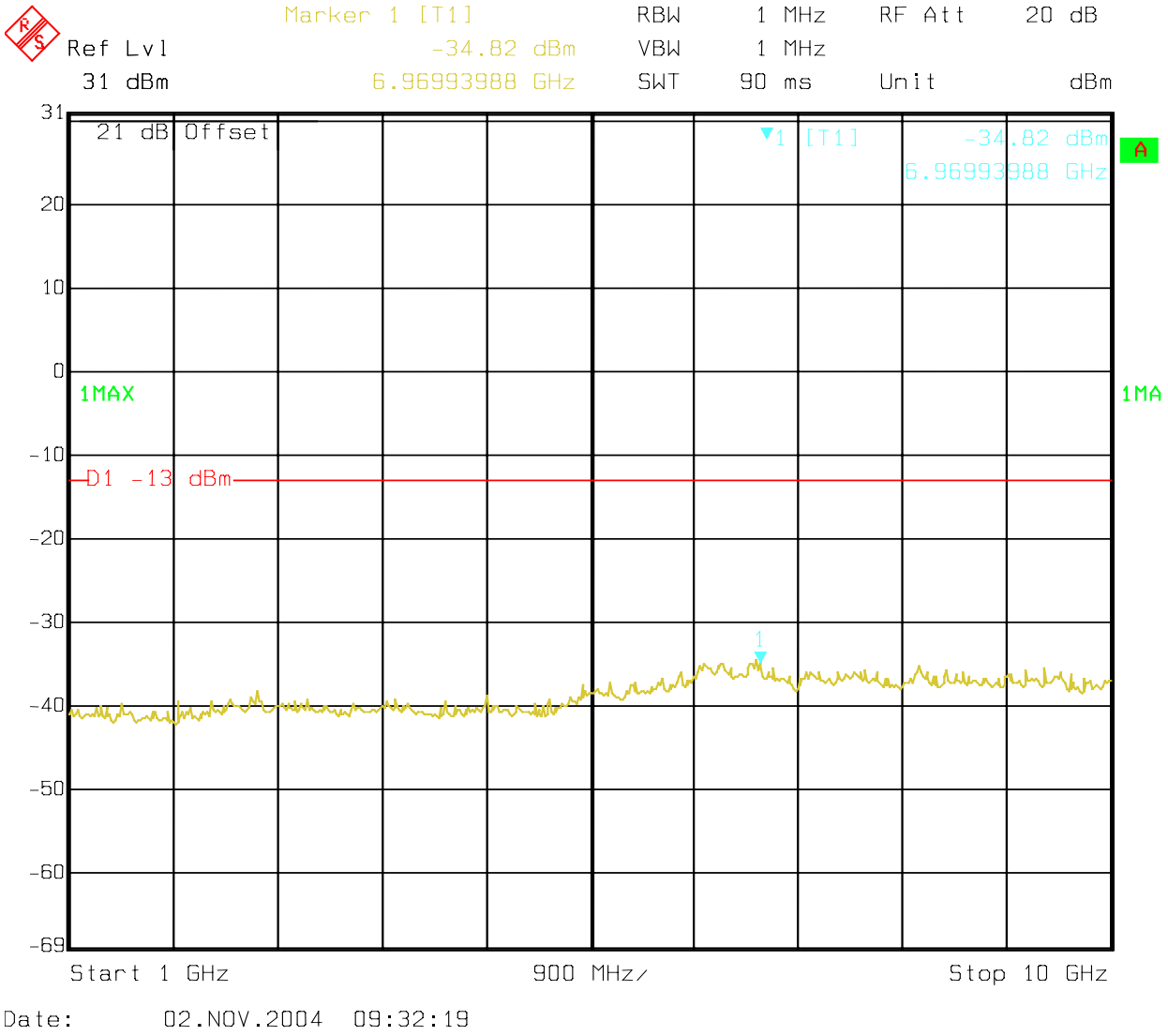
Mid Channel


Marker 1 [T1]
RBW 1 MHz
RF Att 20 dB
Ref Lvl
14.60 dBm
VBW 1 MHz
31 dBm
860.04008016 MHz
SWT 5 ms
Unit dBm
21 dB Offset
1 [T1]
14.60 dBm
860.04008016 MHz
1MAX
1MA
D1 -13 dBm
Start 30 MHz
97 MHz/
Stop 1 GHz
Date: 02.NOV.2004 09:41:50


Marker 1 [T1]
Ref Lvl
31 dBm
-34.96 dBm
6.98797595 GHz
RBW 1 MHz
VBW 1 MHz
SWT 90 ms
RF Att 20 dB
Unit dBm
21 dB Offset
1 [T1]
-34.96 dBm
6.98797595 GHz
A
1MAX
1MA
D1 -13 dBm
31
20
10
0
-10
-20
-30
-40
-50
-60
-69
Start 1 GHz
900 MHz/
Stop 10 GHz
Date: 02.NOV.2004 09:42:18

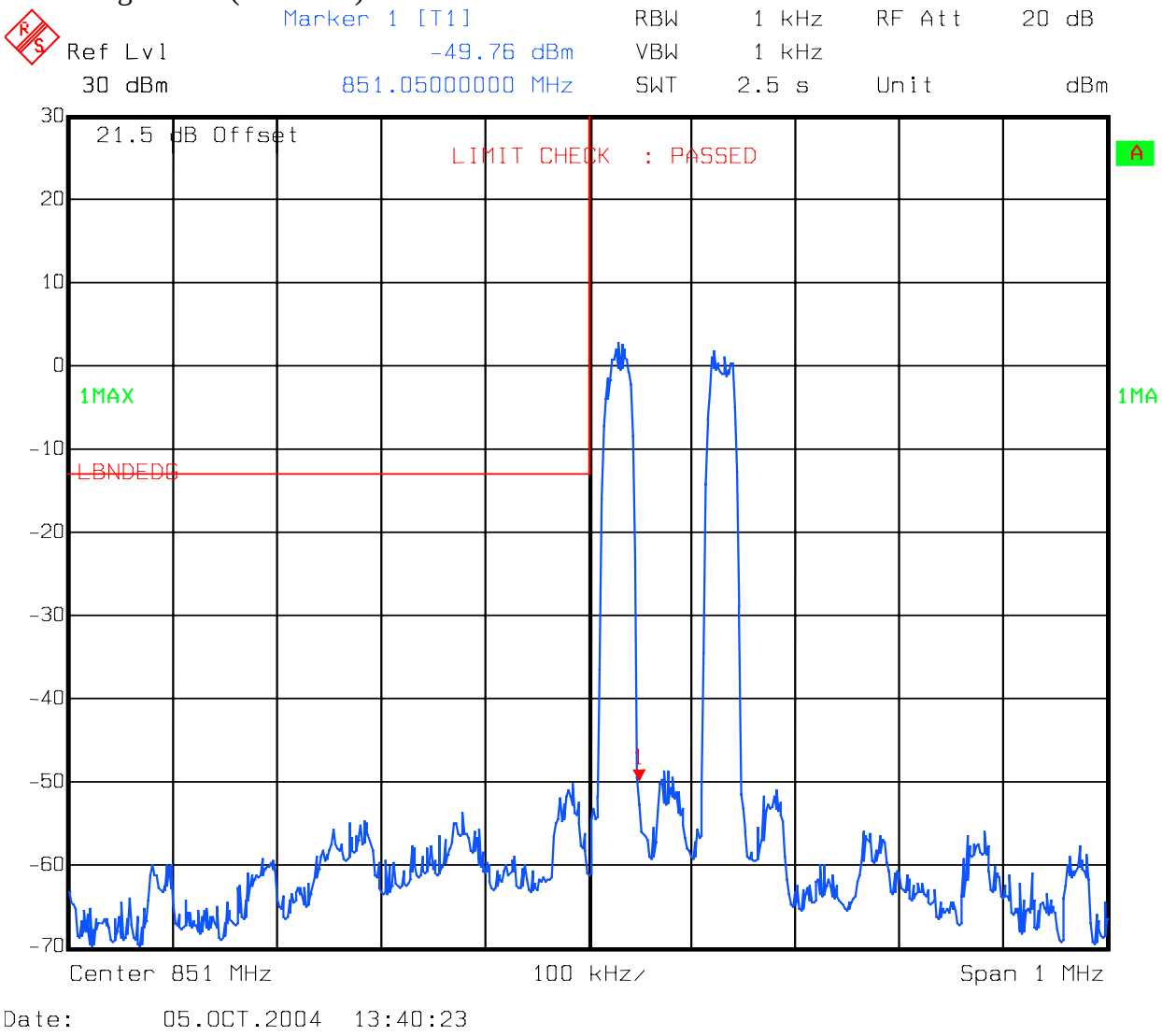
Upper Channel



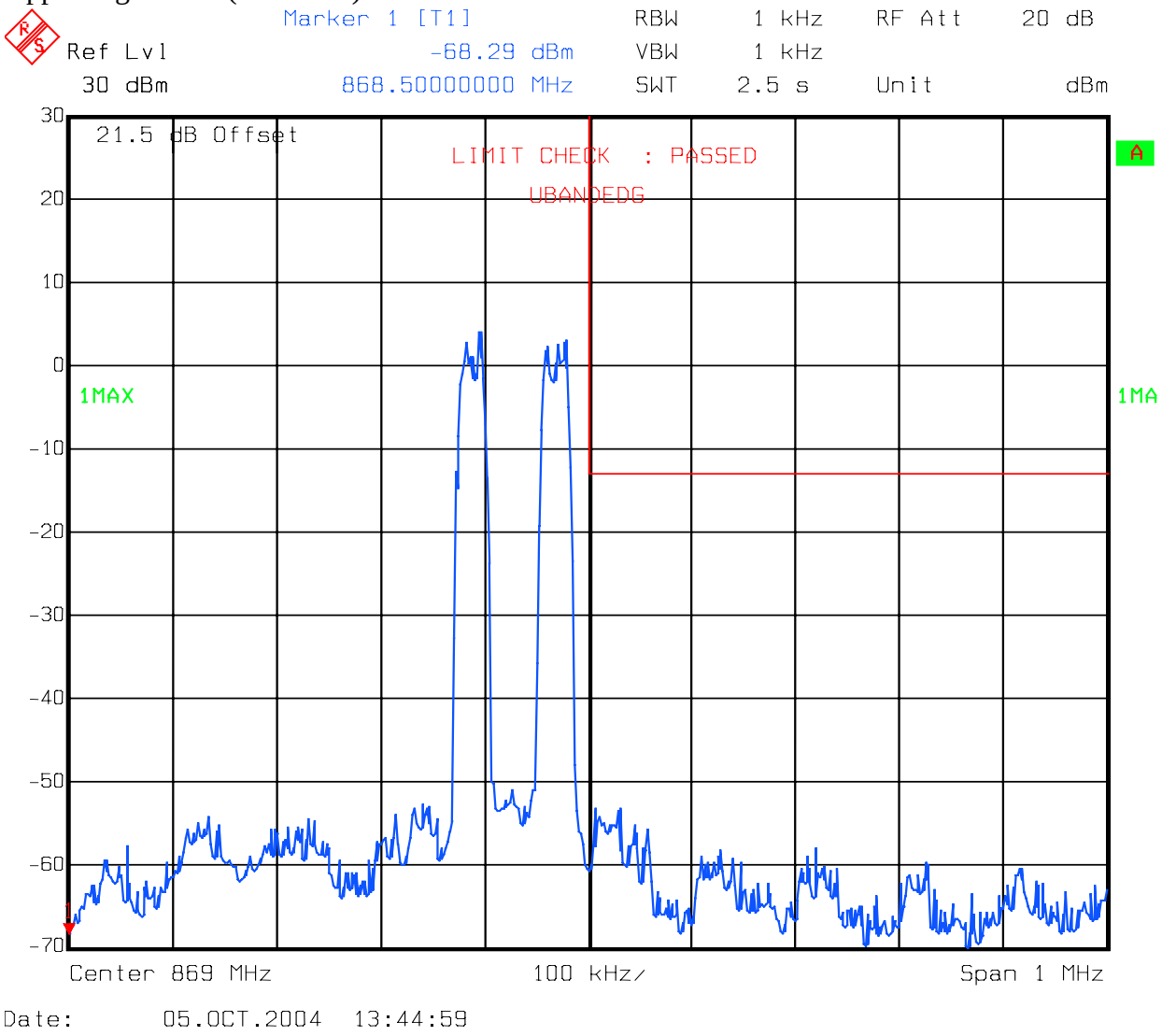

Marker 1 [T1]
Ref Lvl
31 dBm
-34.82 dBm
6.96993988 GHz
RBW 1 MHz
VBW 1 MHz
SWT 90 ms
RF Att 20 dB
Unit dBm
21 dB Offset
1 [T1]
-34.82 dBm
6.96993988 GHz
A
1MAX
1MA
D1 -13 dBm
31
20
10
0
-10
-20
-30
-40
-50
-60
-69
Start 1 GHz
900 MHz/
Stop 10 GHz
Date: 02.NOV.2004 09:32:19

Intermodulation

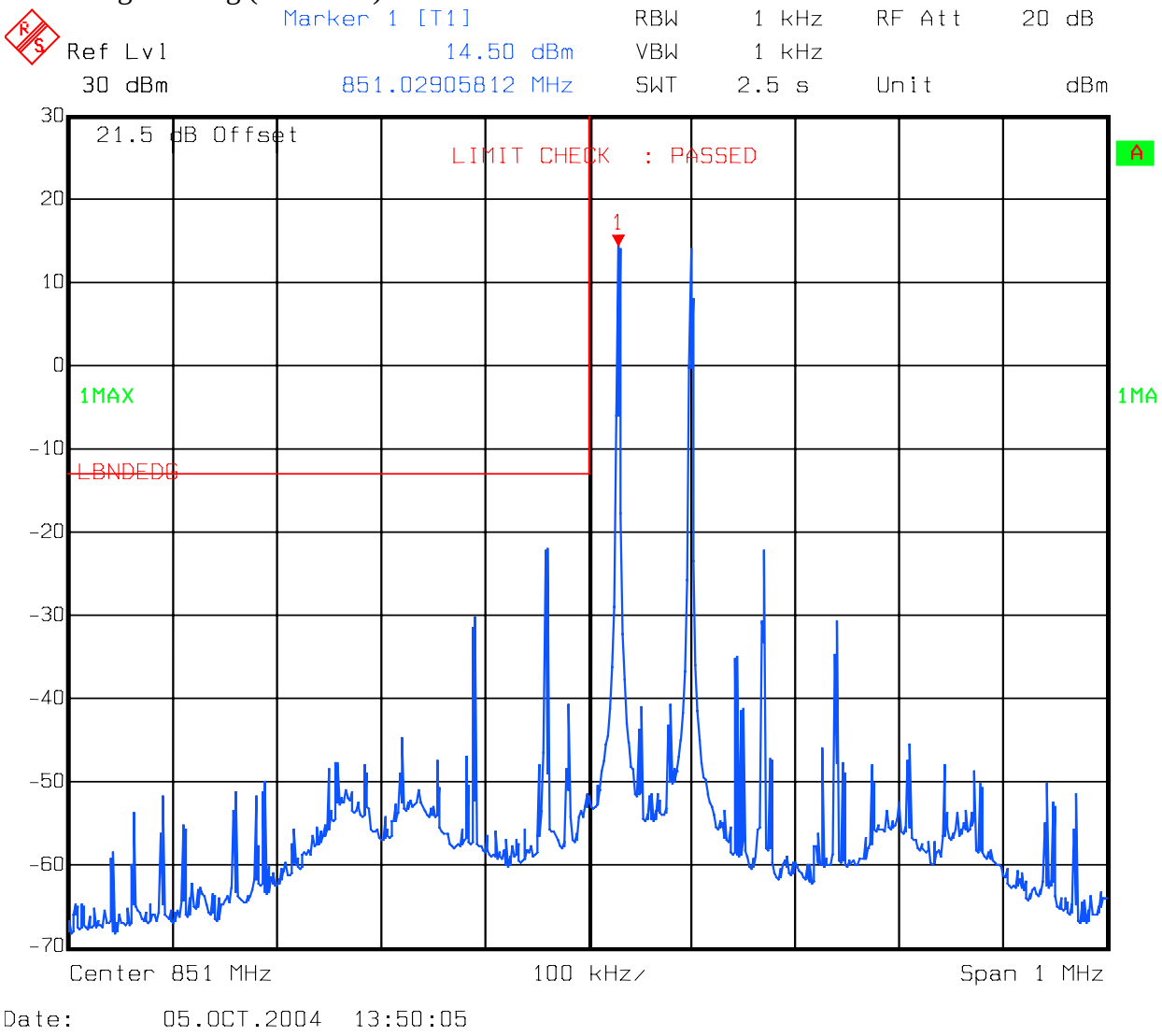
Lower edge iDEN (800 Band)



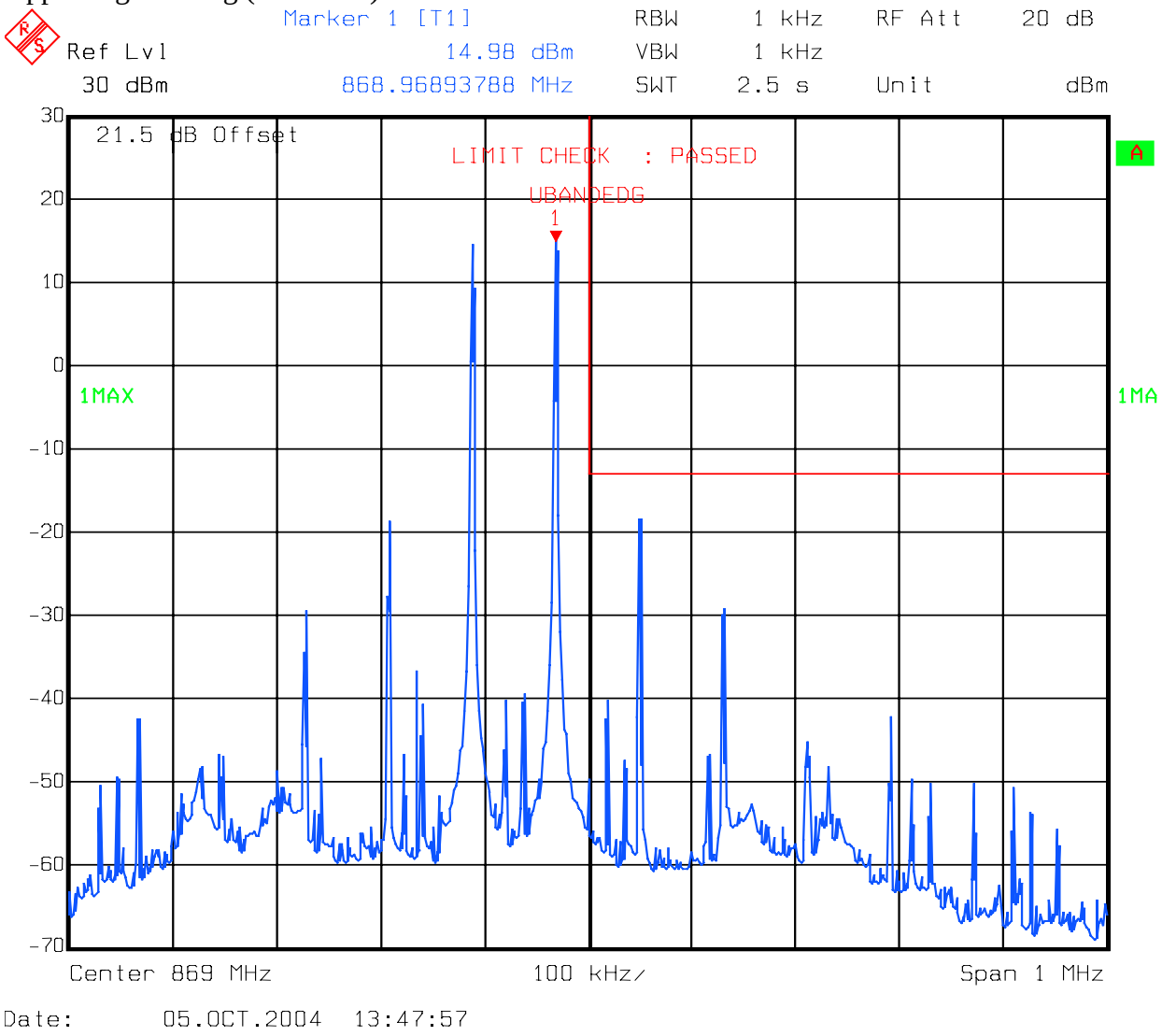
Upper edge iDEN (800 Band)



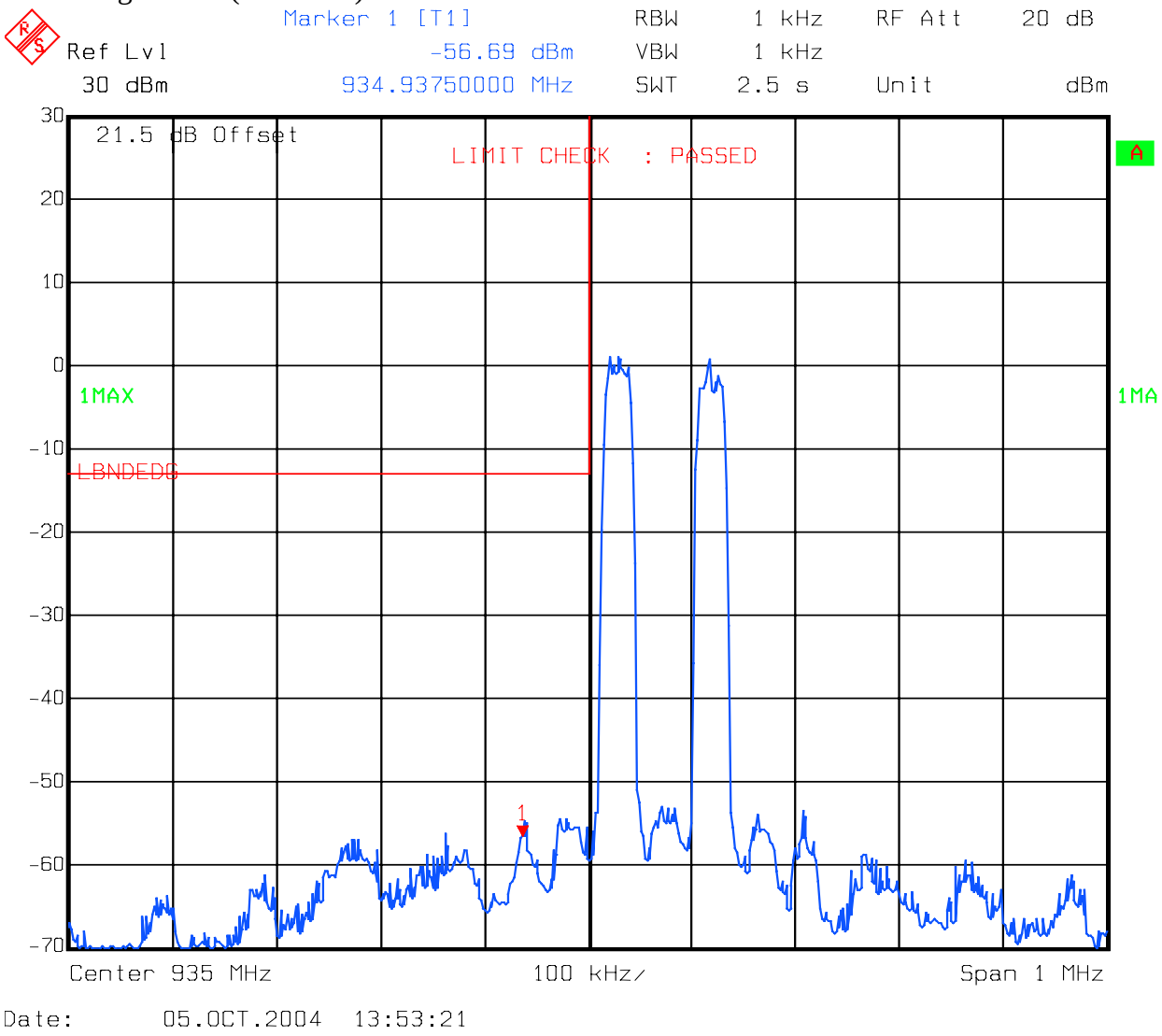
Lower edge Analog (800 Band)



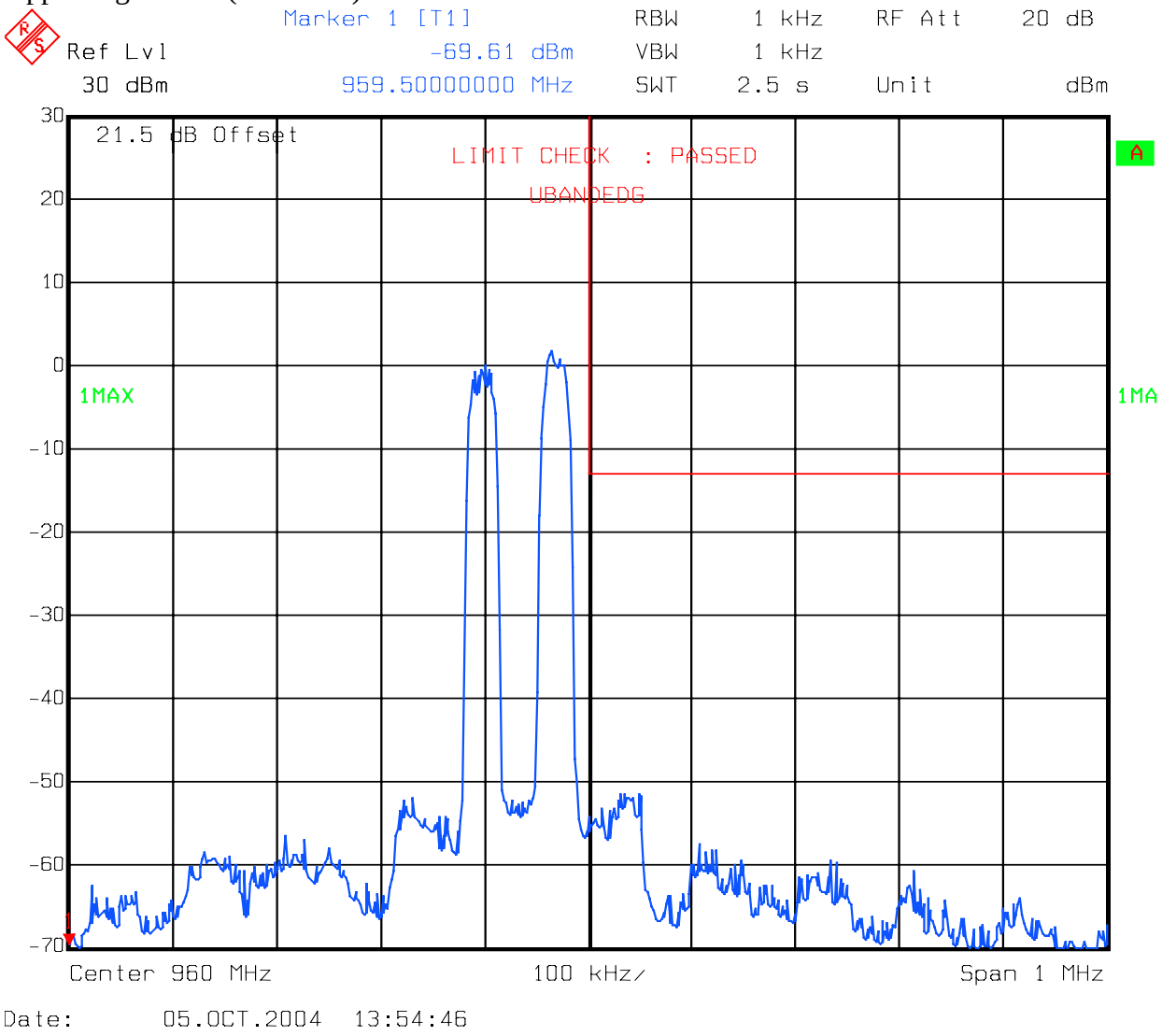
Upper edge Analog (800 Band)



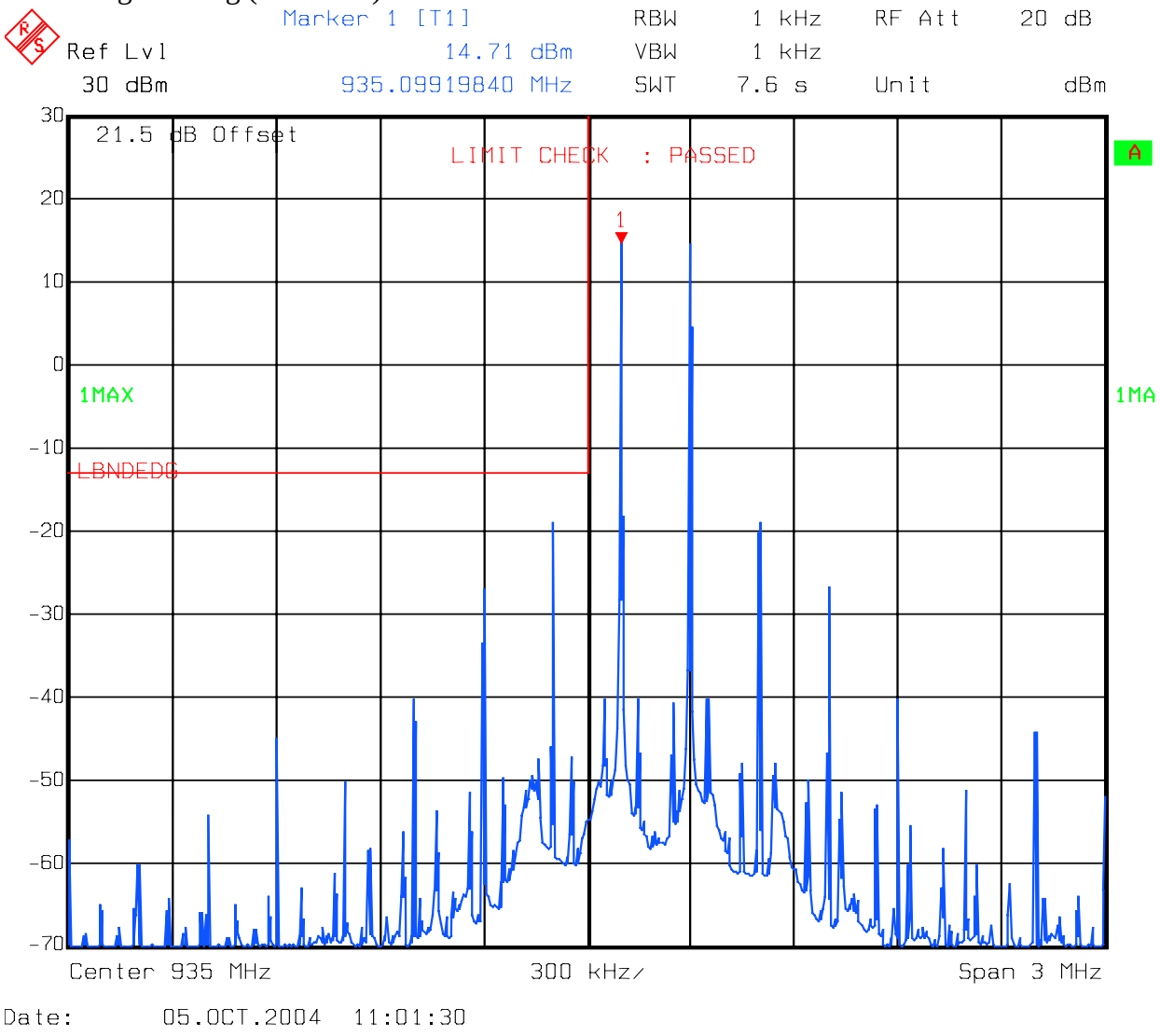
Lower edge iDEN (900 Band)



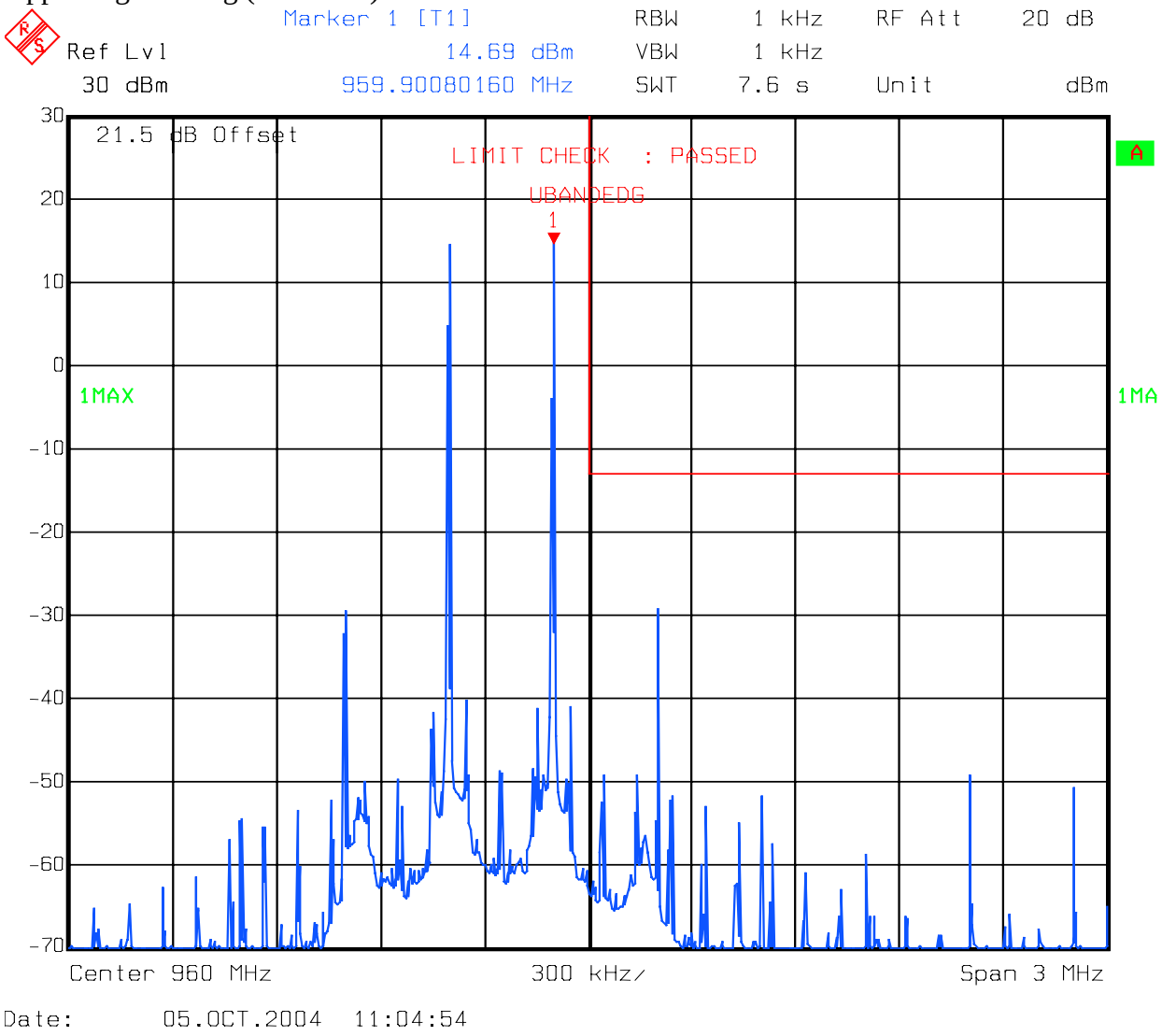
Upper edge iDEN (900 Band)



Lower edge Analog (900 Band)



Upper edge Analog (900 Band)



Section 6. Field Strength of Spurious Emissions

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

Test Results: Complies

Test Data: No Emissions found within 20dB of Limit. Noise from was greater than 20dB below limit. Frequency range scanned from 30MHz to 20GHz

Note: See page A5 for applicable limit.

Equipment Used:

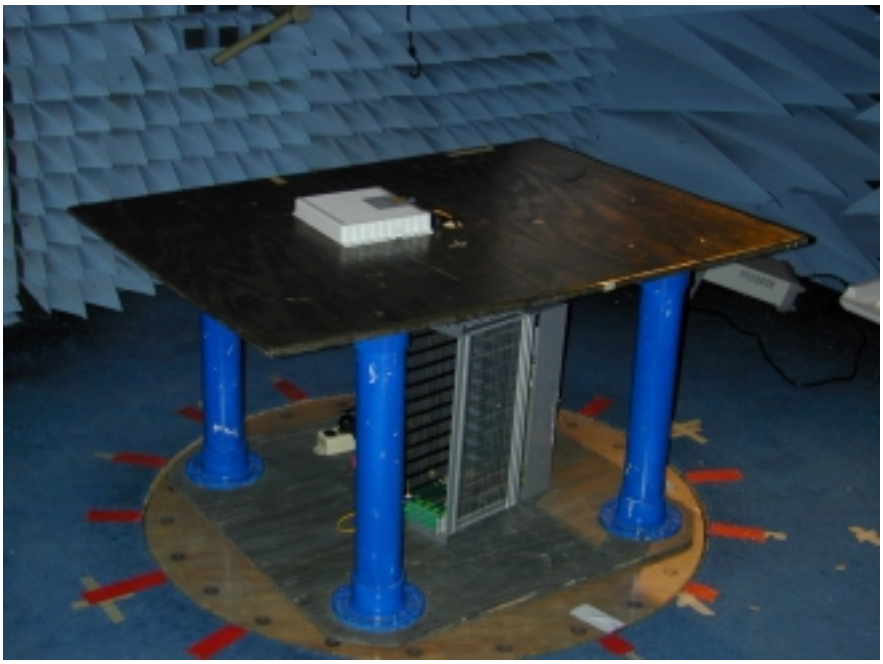
Measurement Uncertainty: +/- 3.6 dB

Temperature: 21 °C

Relative Humidity: 51 %

Photographs of Test Setup

FRONT VIEW



REAR VIEW

Section 7. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 2.995
TESTED BY:	DATE:

Test Results: **Not Applicable.**

Measurement Data: See attached tables.

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
1471	10 db Attenuator DC 18 Ghz	MCL Inc. BW-S10W2 10db-2WDC	NONE	CBU	N/A
1626	CABLE, 5 ft	MEGAPHASE 10311 1GVT4	N/A	CBU	N/A
1627	CABLE, 5 ft	MEGAPHASE 10312 1GVT4	N/A	CBU	N/A
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	09/22/03	09/22/05
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	07/30/04	07/30/05
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	07/30/04	07/30/05
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	10/27/03	10/26/04
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	02/11/03	02/11/05

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.

NAME OF TEST: Spurious Emissions at Antenna Terminals PARA. NO.: 2.991

Test Method: RBW: 1% of emission bandwidth in the 0 - 1 GHz range.
1 MHz at frequencies above 1 GHz.

VBW = RBW

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

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.

Test Method: The substitution antenna method was used to measure erp of spurious emissions. This method is described in EIA/TIA 603. The field strength of the emission is measured and recorded. The EUT is then replaced with a substitution antenna of known gain against a dipole. The substitution antenna is fed with a calibrated signal which is adjusted until the previously recorded value is repeated. The erp of the spurious signal is the level required to repeat the previously measured level. If the substitution antenna gain is calibrated and expressed as dBi (referenced to an isotropic radiator instead of a dipole), the result is adjusted by 2.15 dB so that the result is erp not eirp.

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

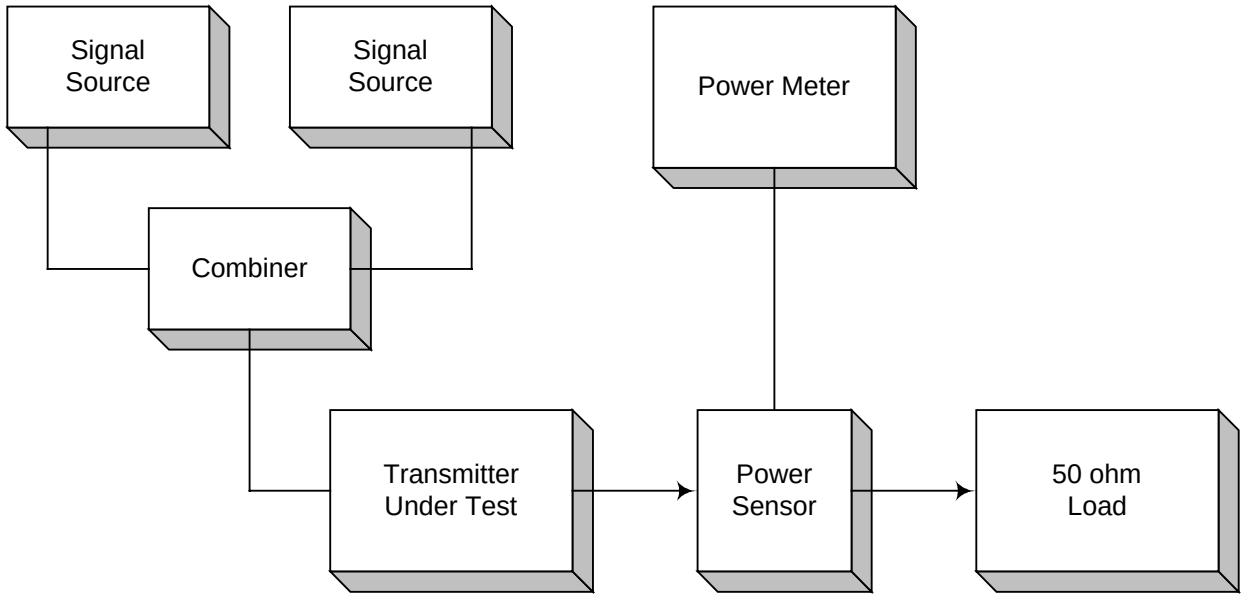
Minimum Standard: Para. No. 990.213. The transmitter carrier frequency shall remain within the assigned frequency below in ppm.

Table 2

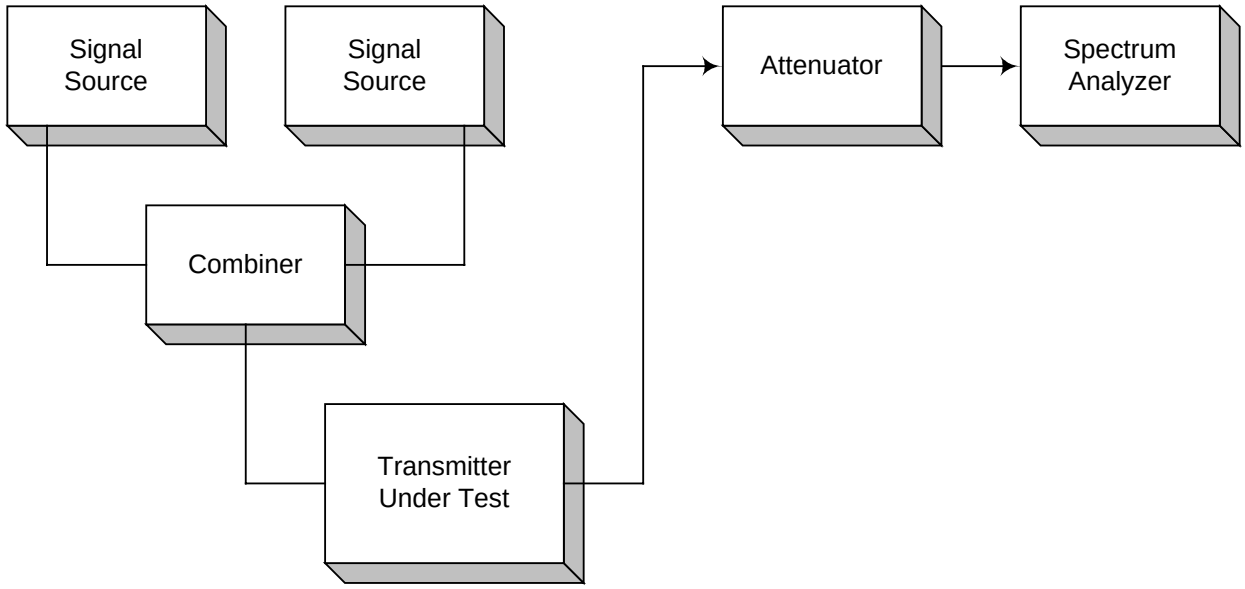
Frequency Band (MHz)	Fixed And Base Stations	Mobile Stations	
		> 2 Watts o/p pwr	< 2 Watts o/p pwr
Below 25	100	100	200
25 - 50	20	20	50
72 - 76	5	-	50
150 - 174	5	5	5
220 - 222	0.1	1.5	1.5
421 - 512	2.5	5	5
806 - 821	1.5	2.5	2.5
821 - 824	1.0	1.5	15
851 - 866	1.5	2.5	2.5
866 - 869	1.0	1.5	1.5
869 -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

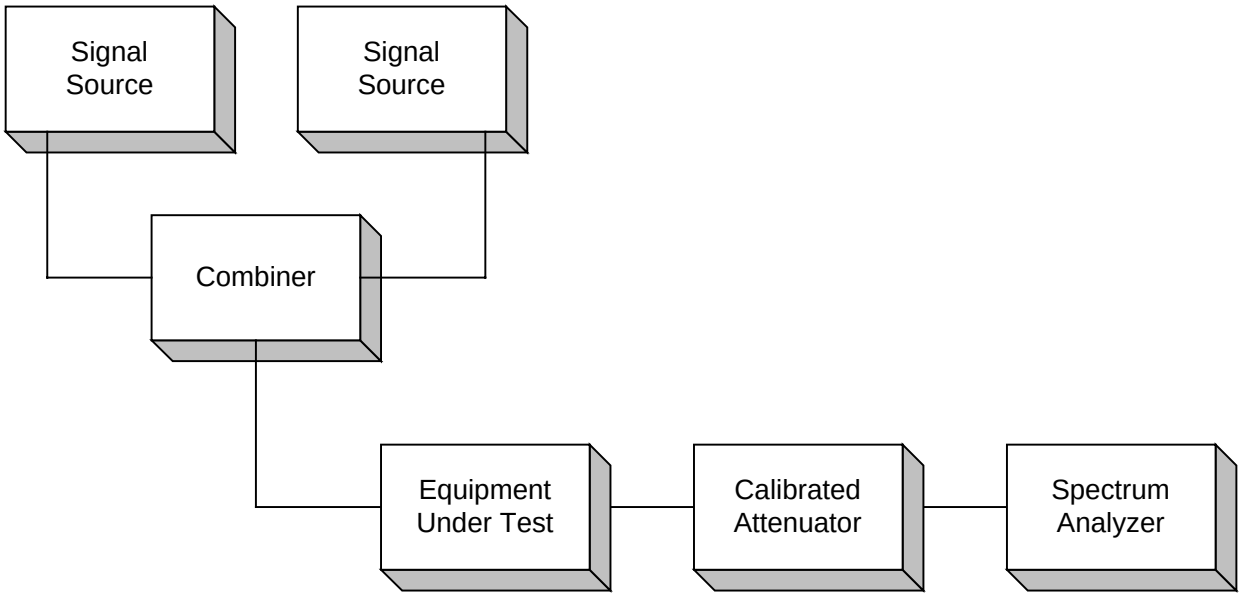
Para. No. 2.985 - R.F. Power Output



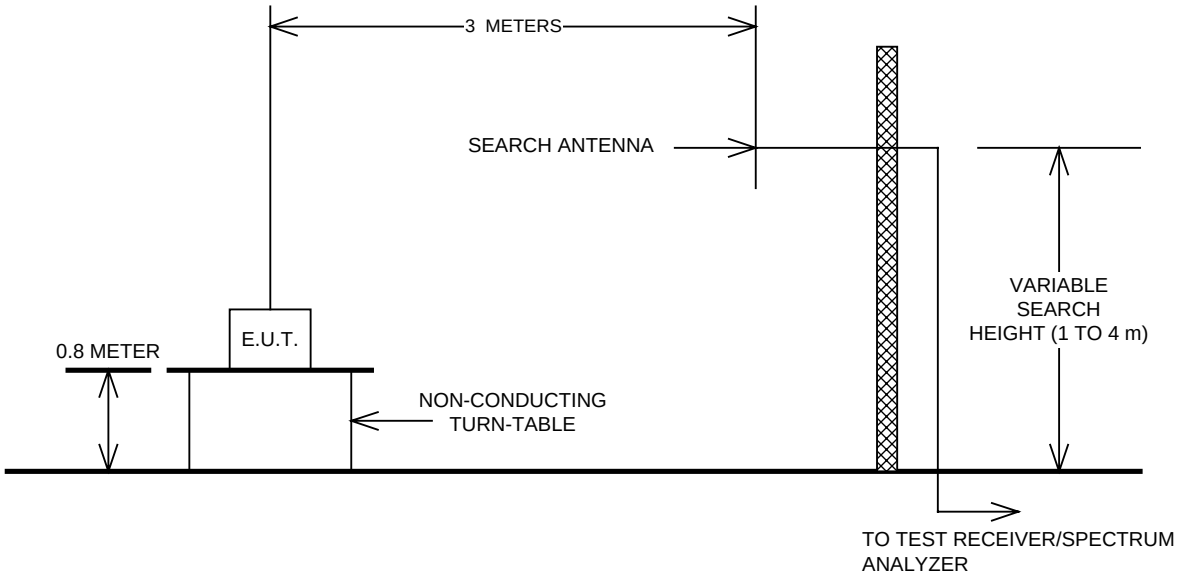
Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 - Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability