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TEST 031

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Test report : 04 / 662 / 3

Item tested : Simrad AI 80 AIS

Equipment type : AIS Transponder

Client : Kongsberg Seatex AS

Tested according to :

IEC 61993-2
(2001-12)

Date of issue : 2004. 08. 26

Authorised by :

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The results detailed in this test report are valid only for the particular sample(s) tested and with configuration(s) as implemented during testing.

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1 GENERAL INFORMATION

1.1 Test Laboratory

Name :	Nemko Comlab AS
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1.2 Client Information

Name :	Kongsberg Seatex AS
Address :	Pirsenteret N-7462 Trondheim
Telephone :	+ 47 73 45 55 00
Fax :	+ 47 73 51 50 20

Contact:

Name :	Sigfred Avdal
E-mail :	sigfred.avdal@kongsberg.com

1.3 Manufacturer

Name :	Kongsberg Seatex A/S
Address :	Pirsenteret N-7642 Trondheim
Telephone :	+47 73 54 55 00
Fax :	+47 73 51 50 20

2 TEST INFORMATION

2.1 Test Item

Name : Simrad AI 80 AIS mobile unit

Model/version : AI 80 v.1.0

Serial number :

Software identity and version : main unit sw 1.00.xx

Remarks / Description of test item

The TDMA receiver measurements are performed with a number of 1000 packets.
For the DSC measurements a number of 100 packets was used.
The client supplied special test software installed in a PC. This software was absolute essential in order to carry out the measurements.
A special test unit was also supplied. This utility equipment was primarily used as a generator for the " wanted signal".

The reference for transmitter "on/off " function is a 5 V TTL control level, named TXON (TX-board).

The EUT was powered by a 24 VDC power supply.

2.2 Standards and Regulations

IEC 61993-2 (First edition (2001-12)) and IEC 60945 (Fourth edition (2002-08))

2.3 Test Environment

Environmental testing are performed according to IEC 60945 chapter 8,1 table 3

2.3.1 Normal Test Conditions

The values are the limits registered during the test period

Normal test voltage 24.0 V

Temperature: 19.9 – 22.9 °C

Relative humidity: 27 –64.9 %

2.3.2 Extreme Test Conditions

The EUT was placed in the chamber at normal room temperature 21.07.2004 13.00 and the first measurement in high temperature (+55 °C) was preformed from 22.07.2004 09.00 and low temperature from 23.07.2004 09.00
See annex 1.

Temperature

T_{min} : -15 °C

T_{max} : +55 °C

Voltage

V_{min} : 21.6 V

V_{max} : 31.2 V

2.4 Test Period

Test item received date : 14.06.04

Test period : from 14.06.04 to 23.07.04

2.5 Test Engineer

Knut Risting Hanssen and Egil J Bredholt

2.6 Additional Information

2.6.1 Test Methods

2.6.2 Selection Criteria

Selected tests have been performed on client's request

3 TEST REPORT SUMMARY

3.1 Abbreviations

P Passed, the equipment fulfils the requirement

F Failed, the equipment does not fulfil the requirement

NA Not applicable, the requirement is not applicable for this type of the equipment

NT Not tested, the test is not performed even though the requirement is relevant

3.2 Test Summary

Transmitter parameters

Frequency error	(P)
Carrier power H (conducted)	(P)
Carrier power L (conducted)	(P)
Modulation Spectrum 25 kHz mode	(P)
Modulation Spectrum 12.5 kHz mode	(P)
Transmitter Attack Time	(P)
Transmitter Release Time	(P)
DSC Transmissions	
Frequency error of the DSC Signal	(P)
Modulation Rate	(P)
TDMA Receivers	
Sensitivity – 25 kHz Operation	(P)
Sensitivity – 12.5 kHz Operation	(P)
Error Behaviour at High Input Levels	(P)
Co–Channel Rejection – 25 kHz Operation	(P)
Co–Channel Rejection – 12.5 kHz Operation	(P)
Adjacent Channel Selectivity – 25 kHz Operation	(P)
Adjacent Channel Selectivity – 12.5 kHz Operation	(P)
Spurious Response Rejection	(P)
Intermodulation Response Rejection and Blocking	(P)
Transmit to Receive Switching Time	(P)
DSC Receiver	
Maximum Sensitivity	(P)
Error Behaviour at High Input Levels	(P)
Co-Channel Rejection	(P)
Adjacent Channel Selectivity	(P)
Spurious Response Rejection	(P)
Intermodulation Response Rejection	(P)
Blocking or Desensitisation	(P)
Conducted Spurious Emissions Conveyed to the Antenna	
Spurious Emissions from the Receiver	(P)
Spurious Emissions from the Transmitter	(P)

4 TEST RESULTS

4.1 Transmitter Measurements

IEC 61993-2, Cl.15.1.1

4.1.1 Frequency Error

Power level at which the measurement has been performed: 2W

Test Conditions		**Frequency Error kHz**			
		156.025 MHz	**157.4125 MHz**	**160.6375 MHz**	**162.025MHz**
T_{nom}	V_{nom}(24.0 V)	-0.021	-0.021	-0.021	-0.023
T_{min}(-15 °C)	V_{min}(21.6 V)	-0.16	-0.14	-0.16	-0.16
	V_{max}(31.2 V)	-0.16	-0.15	-0.15	-0.17
T_{max}(+55 °C)	V_{min}(21.6 V)	-0.27	-0.27	-0.27	-0.28
	V_{max}(31.2 V)	-0.26	-0.27	-0.28	-0.27
Maximum frequency error (kHz)		-0.27	-0.27	-0.28	-0.28
Measurement uncertainty		**≤ ± 50 Hz**			

Limits:

Normal Test Conditions	**Extreme Test Conditions**
± 0,5 kHz	± 1 kHz

Test Equipment Used: 302, 1013, 1201, 1435 and 1442

IEC 61993-2, Cl.15.1.2

4.1.2 Carrier Power

Rated output power level (maximum): 2W, (33 dBm)

Test Conditions		**Transmitter Power dBm**		
		156.025 MHz	**159.025 MHz**	**162.025 MHz**
T_{nom}	V_{nom}(24.0 V)	33.0	33.0	33.0
T_{min}(-15 °C)	V_{min}(21.6 V)	32.1	31.9	31.9
	V_{max}(31.2 V)	32.1	31.9	31.9
T_{max}(+55 °C)	V_{min}(21.6 V)	34.2	34.2	33.5
	V_{max}(31.2 V)	34.2	34.2	33.5
Variation in output power under normal test conditions (dB)		0.0	0.0	0.0
Variation in output power under extreme test conditions (dB)		+1.2 -0.9	+1.2 -1.1	+0.5 -1.1
Measurement uncertainty		**≤ ± 0.7 dB**		

Limits:

Under normal test conditions	± 1.5 dB
Under extreme test conditions	+ 2.0 dB - 3.0 dB

Test Equipment Used: 075, 302, 1079, 1123, 1201, 1338, 1435, 1442 and 1449

4.1.3 Carrier Power

Rated output power level (maximum): 12.5W, (41 dBm)

Test Conditions		**Transmitter Power dBm**		
		156.025 MHz	**159.025 MHz**	**162.025 MHz**
T_{nom}	V_{nom}(24.0 V)	40.7	40.8	41.2
T_{min}(-15 °C)	V_{min}(21.6 V)	40.6	40.6	40.8
	V_{max}(31.2 V)	40.6	40.6	40.8
T_{max}(+55 °C)	V_{min}(21.6 V)	40.4	40.5	40.7
	V_{max}(31.2 V)	40.4	40.5	40.7
Variation in output power under normal test conditions (dB)		-0.3	-0.2	+0.2
Variation in output power under extreme test conditions (dB)		-0.6	-0.5	-0.3
Measurement uncertainty		**≤ ± 0.7 dB**		

Limits:

Under normal test conditions	± 1.5 dB
Under extreme test conditions	+ 2.0 dB - 3.0 dB

Test Equipment Used: 075, 302, 1079, 1123, 1201, 1338, 1435, 1442 and 1449

IEC 61993-2, Cl.15.1.3

4.1.4 Modulation Spectrum 25kHz channel mode

Annex no. 2 page 1 and 2: TDMA, (High / Low power with test signal 2)
Annex no. 2 page 3 and 4: TDMA, (High / Low power with test signal 3)
Annex no. 2 page 5 and 6: DSC, (High / Low power with test signal 1)

Test Equipment Used: 302, 1201, 1337 and 1442

IEC 61993-2, Cl.15.1.4

4.1.5 Modulation Spectrum 12.5kHz channel mode

Annex no. 2, page 7 and 8: TDMA, (High / Low power with test signal 2)
Annex no. 2, page 9 and 10: TDMA, (High / Low power with test signal 3)

Test Equipment Used: 302, 1201, 1337 and 1442

IEC 61993-2, Cl.15.1.5

4.1.6 Transmitter Attack Time

Power level at which the measurement has been performed: 2W

Time Characteristics	159.025 MHz
Time relative to the power rise	0.713 ms
Time relative to the frequency behaviour	<0.3 ms
Maximum of these times	0.713 ms
Measurement uncertainty	**≤ ± 5 %**

See annex no. 3: page 1 and 3.

Limits Clause 15.1.5

The transmitter attack time shall not exceed:	1 ms

Test Equipment Used: 75, 86, 302, 1007, 1047, 1079, 1139, 1201, 1207, 1239, 1337 and 1442

Power level at which the measurement has been performed: 12.5W

Time Characteristics	159.025 MHz
Time relative to the power rise	0.809 ms
Time relative to the frequency behaviour	<0.3 ms
Maximum of these times	0.809 ms
Measurement uncertainty	**≤ ± 5 %**

See annex no. 4: page 1 and 3.

Limits Clause 15.1.5

The transmitter attack time shall not exceed:	1 ms

Test Equipment Used: 75, 86, 302, 1007, 1047, 1079, 1139, 1201, 1207, 1239, 1337 and 1442

IEC 61993-2, Cl.15.1.6

4.1.7 Transmitter Release Time

Power level at which the measurement has been performed: 2W

Time Characteristics	**159.025 MHz**
Time relative to the power decrease	0.713 ms
Measurement uncertainty	**≤ ± 5 %**

See annex no. 3: page 2.

Limits Clause 15.1.6

The transmitter release time shall not exceed:	1 ms

Test Equipment Used: 75, 86, 302, 1007, 1047, 1079, 1139, 1201, 1207, 1239, 1337 and 1442

Power level at which the measurement has been performed: 12.5W

Time Characteristics	**159.025 MHz**
Time relative to the power decrease	0.741 ms
Measurement uncertainty	**≤ ± 5 %**

See annex no. 4: page 2.

Limits Clause 15.1.6

The transmitter release time shall not exceed:	1 ms

Test Equipment Used: 75, 86, 302, 1007, 1047, 1079, 1139, 1201, 1207, 1239, 1337 and 1442

4.2 DSC Transmissions

IEC 61993-2, Cl.15.2.1

4.2.1 Frequency error of the DSC Signal

Power level at which the measurement has been performed: 2W

Test Conditions		**Frequency Error Hz**	
		B (2100Hz)	**Y (1300Hz)**
T_{nom}	V_{nom} (24.0 V)	-0.05	-0.07
T_{min} (-15 °C)	V_{min} (21.6 V)	+0.22	-0.56
	V_{max} (31.2 V)	+0.04	-0.61
T_{max} (+55 °C)	V_{min} (21.6 V)	-0.41	-0.43
	V_{max} (31.2 V)	-0.38	-0.55
Maximum frequency error (Hz)		0.41	0.61
Measurement uncertainty		**≤ ± 0.5 Hz**	

Limits:

Normal Test Conditions	**Extreme Test Conditions**
± 1.0%	± 1.0%

Test Equipment Used: 302, 1013, 1047, 1201, 1435 and 1442

IEC 61993-2, Cl.15.2.2

4.2.2 Modulation Rate

Measured Baud rate	**Limit**
1199.9764	1200 ± 30 ppm
Measurement uncertainty	**≤ ± 10 ppm**

Measured on printed circuit board with a frequency counter.

Test Equipment Used: 302 and 1013

4.3 TDMA Receivers

IEC 61993-2, Cl.15.3.1

4.3.1 Sensitivity – 25kHz Operation

Test Conditions		Receiver Sensitivity dBm (PER %)	
		156,025MHz	**162,025MHz**
T_{nom}	V_{nom} (24.0 V)	-110.0 (19.9)	-109.5 (15.1)
T_{min} (-15°C)	V_{min} (21.6 V)	-109.0 (14.5)	-109.5 (15.4)
	V_{max} (31.2 V)	-109.0 (17.4)	-109.5 (15.1)
T_{max} (+55 °C)	V_{min} (21.6 V)	-107.0 (18.0)	-108.0 (17.9)
	V_{max} (31.2 V)	-107.0 (19.2)	-108.0 (19.1)
Measurement uncertainty		**≤ ± 1.5 dB**	
Test criteria		PER =20%	

Limits Clause 15.3.1

Normal test conditions	-107 dBm
Extreme test conditions	-101 dBm

Test Equipment Used: 302, 1079, 1123, 1201, 1435 and 1442

IEC 61993-2, Cl.15.3.2

4.3.2 Sensitivity – 12.5kHz Operation

Test Conditions		Receiver Sensitivity dBm (PER %)	
		157,4125MHz	**160,6375MHz**
T_{nom}	V_{nom} (24.0 V)	-102.0 (15.5)	-102.0 (11.2)
T_{min}(-15 °C)	V_{min} (21.6 V)	-103.0 (13.2)	-103.0 (15.6)
	V_{max} (31.2 V)	-103.0 (15.0)	-103.0 (15.6)
T_{max}(+55 °C)	V_{min} (21.6 V)	-101.0 (18.6)	-101.0 (11.0)
	V_{max} (31.2 V)	-101.0 (16.6)	-101.0 (11.7)
Measurement uncertainty		**≤ ± 1.5 dB**	
Test criteria		PER =20%	

Limits Clause 15.3.2

Normal test conditions	-98 dBm
Extreme test conditions	-92 dBm

Test Equipment Used: 302, 1079, 1123, 1201, 1435 and 1442

IEC 61993-2, Cl.15.3.3

4.3.3 Error Behaviour at High Input Levels

Test Signal 2 159.025 MHz

Input to receiver	**Number of Messages not Correctly Received at**	
	- 7dBm	**- 77dBm**
	0.3 %	0.1 %
Variation in %	0.2	
Measurement uncertainty	**≤ ± 0.5 dB**	

The level of wanted signal: -104 dBm

Limit Clause 15.3.3

Variation between –7 dBm and –77 dBm	≤ 1%

Test Equipment Used: 302, 1079, 1201, 1337 and 1442

Test Signal 3 159.025 MHz

Input to receiver	**Number of Messages not Correctly Received at**	
	- 7dBm	**- 77dBm**
	0.2	0.0
Variation in %	0.2	
Measurement uncertainty	**≤ ± 0.5 dB**	

Limit Clause 15.3.3

Variation between –7 dBm and –77 dBm	≤ 1%

Test Equipment Used: 302, 1079, 1201, 1337 and 1442

IEC 61993-2, Cl.15.3.4

4.3.4 Co-Channel Rejection - 25kHz Operation

Frequency Of Unwanted Signal	Co-Channel Rejection Ratio dB (PER %)		
	156.025 MHz	**159.025 MHz**	**162.025 MHz**
f + 3000Hz	-10.0 (13.3)	-10.0 (8.1)	-10.0 (15.1)
f	-10.0 (11.2)	-10.0 (11.4)	-10.0 (13.6)
f - 3000Hz	-10.0 (19.7)	-10.0 (18.8)	-10.0 (17.9)
Measurement uncertainty	**≤ ± 1.0 dB**		

The level of wanted signal: -104 dBm

Limits Clause 15.3.4

Channel Separation: 25kHz	-10dB<Limit<0dB (and >0)

Test Equipment Used: 086, 302, 1007, 1079, 1123, 1201 and 1442

IEC 61993-2, Cl.15.3.5

4.3.5 Co-Channel Rejection - 12.5kHz Operation

Frequency Of Unwanted Signal	Co-Channel Rejection Ratio dB (PER %)	
	157.4125 MHz	**160.6375 MHz**
f + 1500Hz	-16.5 (18.0)	-16.5 (13.5)
f	-14.5 (16.1)	-13.0 (10.3)
f - 1500Hz	-16.5 (14.8)	-16.0 (13.7)
Measurement uncertainty	**≤ ± 1.0 dB**	

The level of wanted signal: -95 dBm

Limits Clause 15.3.5

Channel Separation: 12.5kHz	-18dB<Limit<0dB (and >0)

Test Equipment Used: 086, 302, 1007, 1079, 1123, 1201 and 1442

IEC 61993-2, Cl.15.3.6

4.3.6 Adjacent Channel Selectivity – 25kHz Operation

Test Conditions		Adjacent Channel Selectivity Ratio dB (PER %)			
		156.025 MHz		162.025 MHz	
		+ 25 kHz	- 25 kHz	+ 25 kHz	- 25 kHz
T_{nom}	V_{nom} (24 V)	70.0 (8.9)	70.0 (11.4)	70.0 (1.8)	70.0 (3.2)
T_{min}(-15 °C)	V_{min} (21.6 V)	69.0 (15.4)	63.0 (11.9)	70.5 (14.5)	69.5 (16.7)
	V_{max} (31.2V)	69.0 (14.7)	63.0 (9.5)	70.5 (11.6)	70.0 (16.9)
T_{max}(+55 °C)	V_{min} (21.6 V)	67.0 (17.0)	66.5 (17.2)	74.0 (7.0)	74.0 (4.1)
	V_{max} (31.2 V)	67.0 (15.0)	66.5 (15.7)	74.0 (8.0)	74.0 (14.0)
Measurement uncertainty		**≤ ± 2.5 dB**			

The level of wanted signal: -104 dBm (Normal test condition)
The level of wanted signal: -95 dBm (Extreme test conditions)

Limits Clause 15.3.6

Channel Separation	Normal Conditions	Extreme Conditions
25,0 kHz	70,0 dB	60,0 dB

Test Equipment Used: 086, 302, 1007, 1079, 1123, 1201, 1435 and 1442

IEC 61993-2, Cl.15.3.7

4.3.7 Adjacent Channel Selectivity – 12.5kHz Operation

Test Conditions		Adjacent Channel Selectivity Ratio dB (PER %)			
		157.4125 MHz		160.6375 MHz	
		+ 12.5 kHz	- 12.5 kHz	+ 12.5 kHz	- 12.5 kHz
T_{nom}	V_{nom} (24 V)	50.0 (2.2)	50.0 (1.2)	50.0 (1.4)	50.0 (1.6)
T_{min}(-15 °C)	V_{min} (21.6 V)	54.0 (19.9)	53.0 (12.7)	54.0 (19.4)	54.0 (19.4)
	V_{max} (31.2V)	54.0 (16.0)	53.0 (12.2)	54.0 (16.5)	54.0 (14.1)
T_{max}(+55 °C)	V_{min} (21.6 V)	51.5 (12.3)	51.5 (7.3)	53.5 (12.3)	54.5 (9.6)
	V_{max} (31.2 V)	51.5 (16.5)	51.5 (8.7)	53.5 (13.5)	54.5 (10.6)
Measurement uncertainty		**≤ ± 2.5 dB**			

The level of wanted signal: -95 dBm (Normal test condition)
The level of wanted signal: -86 dBm (Extreme test conditions)

Limits Clause 15.3.7

Channel Separation	Normal Conditions	Extreme Conditions
12,5 kHz	50,0 dB	50,0 dB

Test Equipment Used: 086, 302, 1007, 1079, 1123, 1201, 1435 and 1442

IEC 61993-2, Cl.15.3.8

4.3.8 Spurious Response Rejection

TDMA Receiver

Spurious Response Rejection	
159.025 MHz	
Frequency MHz	**Ratio dB**
158.025	>75
Other (0.1 MHz – 2 GHz)	>80
-	
Measurement uncertainty	**≤ ± 2.5 dB**

Limits Clause 15.3.8

Rejection ratio limit	70,0 dB

Test Equipment Used: 302, 1047, 1079, 1123, 1201, 1240 and 1442

IEC 61993-2, Cl.15.3.9

4.3.9 Intermodulation Response Rejection and Blocking

Test 1 and 2:

Measured value	Generator A	Generator B	Generator C	Generator D
PER %	-101 dBm	-27 dBm	-27 dBm	-15 dBm
8.9	156.025	156.525	157.025	161.750
1.3	162.025	161.525	161.025	156.300
1.4	156.025	155.525	155.025	150.300
0.6	162.025	162.525	163.025	167.750
Measurement uncertainty		**≤ ± 2 dB**		

Measured with standard test signal 2.

Limits Clause 15.3.9

The packet error rate, with the outputs of signal generators B, C and D switched on, shall be 20% or less.

Test Equipment Used: 289, 302, 1007, 1079, 1123, 1136, 1139, 1201, 1435 and 1442

IEC 61993-2, Cl.15.3.10

4.3.10 Transmit to Receive Switching Time

MHz	Measurement results	Required results
156.025	-109 dBm (11.0 %)	-107dBm, PER ≤ 20%
162.025	-109 dBm (14.6 %)	-107dBm, PER ≤ 20%
Measurement uncertainty	**≤ ± 1.5 dB**	

Test Equipment Used: 16, 130, 208, 1201

4.4 DSC Receiver

IEC 61993-2, Cl.15.4.1

4.4.1 Maximum Sensitivity

Test Conditions		Receiver Sensitivity dBm (BER %)		
		156.525 MHz	156.525 MHz + 1.5 kHz	156.525 MHz - 1.5 kHz
T_{nom}	V_{nom} (24.0 V)	-111.5 (0.70)	-109.5 (0.75)	-108.5 (0.53)
T_{min} (-15 °C)	V_{min} (21.6 V)	-109 (0.35)	-109 (0.65)	-109 (0.10)
	V_{max} (31.2 V)	-109 (0.47)	-109 (0.91)	-109 (0.35)
T_{max} (+55 °C)	V_{min} (21.6 V)	-109 (0.43)	-108.5 (0.47)	-107.5 (0.34)
	V_{max} (31.2 V)	-110.5 (0.55)	-108.5 (0.56)	-107.5 (0.53)
Measurement uncertainty		**≤ ± 1.5 dB**		
Test criterium		BER $=10^{-2}$		

Limits Clause 15.4.1

Normal test conditions	≤ - 107dBm
Extreme test conditions	≤ - 101dBm

Test Equipment Used: 302, 1079, 1123, 1201, 1435 and 1442

IEC 61993-2, Cl.15.4.2

4.4.2 Error Behaviour at High Input Levels

Test Signal 1

Measured value	$7.5*10^{-5}$
Measurement uncertainty	**≤ ± 0.5 dB**

The level of wanted signal: -7 dBm

Limit Clause 15.4.2

BER	$\leq 10^{-2}$

Test Equipment Used: 302, 1079, 1123, 1201 and 1442

IEC 61993-2, Cl.15.4.3

4.4.3 Co-Channel Rejection

Frequency Of Unwanted Signal	Co-Channel Rejection Ratio dB (BER %)
f + 3000Hz	-8.0 (0.2)
f	-8.0 (0.5)
f - 3000Hz	-8.0 (0.4)
Measurement uncertainty	**≤ ± 1.0 dB**

The level of wanted signal: -104 dBm

Limits Clause 15.4.3

Channel Separation: 25kHz	-10dB <Limit< 0dB (and >0)
BER	$\leq 10^{-2}$

Test Equipment Used: 86, 302, 1007, 1079, 1117, 1123, 1134, 1201 and 1442

IEC 61993-2, Cl.15.4.4

4.4.4 Adjacent Channel Selectivity

Test Conditions		Adjacent Channel Selectivity Ratio dB (BER %)	
		156.525 MHz	
		+ 25 kHz	**- 25 kHz**
T_{nom}	V_{nom} (24.0 V)	75 (0.47)	75 (0.50)
T_{min} (-15 °C)	V_{min} (21.6 V)	75 (0.62)	75 (0.93)
	V_{max} (31.2 V)	75 (0.47)	75 (0.60)
T_{max} (+55 °C)	V_{min} (21.6 V)	75 (0.81)	75 (0.34)
	V_{max} (31.2 V)	74 (0.75)	75 (0.47)
Measurement uncertainty		**$\leq$ $\pm$ 2.5 dB**	
Test criterium		BER $\leq 10^{-2}$	

BER < $2*10^{-5}$ (No loss of packets)
The level of wanted signal: -104 dBm (Normal and extreme test conditions)

Limits Clause 15.4.4

Channel Separation	Normal Conditions	Extreme Conditions
25,0 kHz	70,0 dB	60,0 dB

Test Equipment Used: 86, 302, 1007, 1079, 1117, 1123, 1134, 1201, 1435 and 1442

IEC 61993-2, Cl.15.4.5

4.4.5 Spurious Response Rejection

DSC Receiver

Spurious Response Rejection	
156.525 MHz	
Frequency MHz	**Ratio dB**
0.1 MHz – 2 GHz	>75
-	-
Measurement uncertainty	**≤ ± 2.5 dB**

The level of wanted signal: -104 dBm

Limits Clause 15.4.5

Rejection ratio limit	70,0 dB
BER	≤ 10^{-2}

Test Equipment Used: 302, 1047, 1079, 1123, 1201, 1240 and 1442

IEC 61993-2, Cl.15.4.6

4.4.6 Intermodulation Response Rejection

Frequency Increments Of Unwanted Signals	**Intermodulation Response Rejection Ratio dB (BER %)**
	156.525 MHz
-50 / -100 kHz	>75 (0.07)
+50 / +100 kHz	>75 (0.17)
Measurement uncertainty	**≤ ± 2.0 dB**

The level of wanted signal: -104 dBm

Limits Clause 15.4.6.

The intermodulation response rejection ratio	> 65.0dB
BER	≤ 10^{-2}

Test Equipment Used: 2, 289, 302, 1002, 1079, 1123, 1136, 1139, 1201 and 1442

IEC 61993-2, Cl.15.4.7

4.4.7 Blocking or Desensitisation

Frequency Of Wanted Signal	Blocking or Desensitisation Ratio dB (BER %)
	156.525 MHz
F - 1 MHz	>90 (0.04)
F - 2 MHz	>90 (0.06)
F - 5 MHz	>90 (0.05)
f - 10 MHz	>90 (0.02)
F + 1 MHz	>90 (0.02)
F + 2 MHz	>90 (0.09)
F + 5 MHz	>90 (0.16)
f + 10 MHz	>90 (0.10)
Measurement uncertainty	**≤ ± 2.5 dB**

The level of wanted signal: -104 dBm

Limits Clause 15.4.7

The blocking ratio	≥ 84.0dB
BER	≤ 10^{-2}

Test Equipment Used: 86, 302, 1007, 1079, 1117, 1123, 1134, 1201 and 1442

IEC 61993-2, Cl.15.5.1

4.5 Conducted Spurious Emissions Conveyed to the Antenna

4.5.1 Spurious Emissions from the Receiver

Spurious Emissions		
159.025 MHz (TDMA), 156.525 MHz (DSC)		
Frequency MHz	Bandwidth kHz	Level dBm
0.15 - 2000	Max.100	<-70
Measurement uncertainty		**≤ ± 1.1 dB**

Bandwidth (kHz) refers to the bandwidth of the measuring spectrum analyzer.
A peak detector is used.

Limits Clause 15.5.1

	Frequency Range	**Limits**
Conducted	150 KHz to 1 GHz	2 nW (-57,0 dBm)
	1 GHz to 2 GHz	20nW (-47,0 dBm)

Test Equipment Used: 302, 1079, 1123, 1201 and 1442

IEC 61993-2, Cl.15.5.2

4.5.2 Spurious Emissions from the Transmitter

Spurious Emissions		
159.025 MHz		
Frequency MHz	Bandwidth kHz	Level dBm
318.050	10	-41.5
Others 0.15 - 2000	-	< limit –10 dB
Measurement uncertainty		**≤ ± 1.1 dB**

* With 12.5 W output power. With 2 W output power, all < limit – 10 dB.
Bandwidth (kHz) refers to the bandwidth of the spectrum analyzer.
A peak detector is used.

Limits Clause 15.5.2

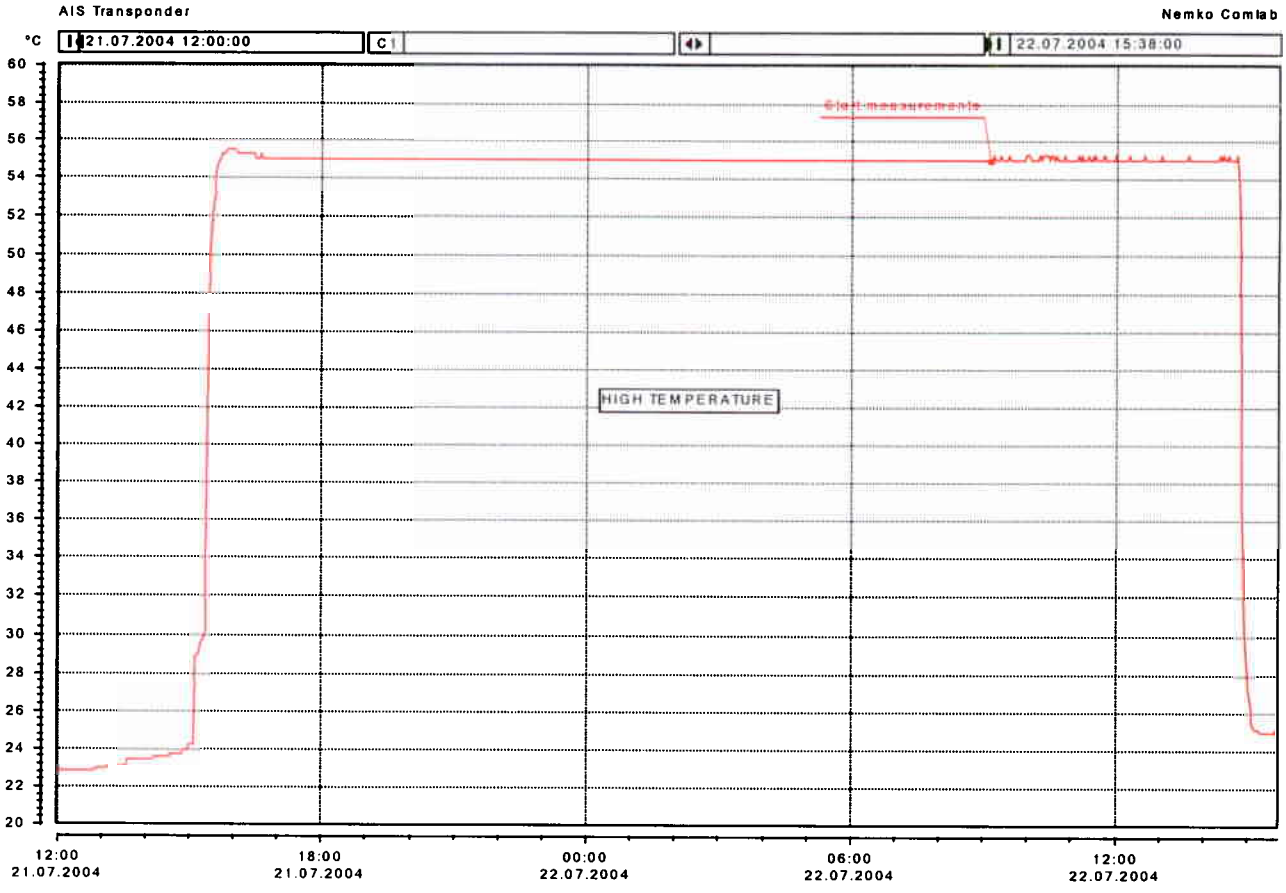
	Frequency Range	Limits
Conducted	150 KHz to 1 GHz	0,25 µW (-36,0 dBm)
	1 GHz to 2 GHz	1 µW (-30,0 dBm)

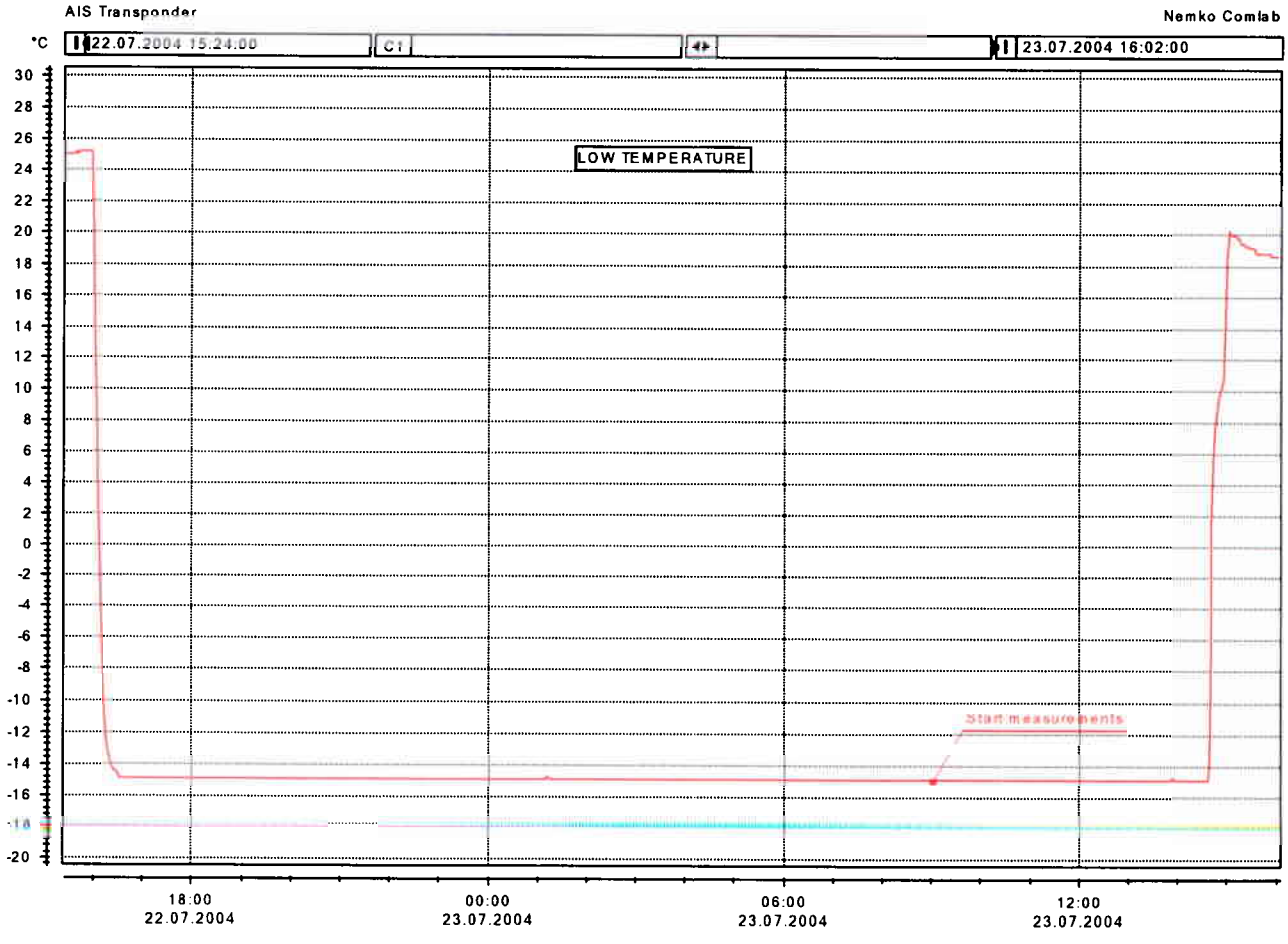
Test Equipment Used: 302, 1079, 1123 1169, 1170, 1201 and 1442

5 TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

To simplify identification of the test equipment and ancillaries used, all item used are identified by the testhouse on each page of the test report. All numbers are referenced to the list given below.

C	No	Instrument/Ancillary	Manufacturer	Type
LR	002	Generator, AF/../UHF	R&S	SMPD
LR	075	Wattmeter, RF, Wideband	HP	HP435A
LR	086	Hybrid	Anzaz	H-9
LR	289	Hybrid	Anzaz	DS-4-4
LR	302	Multimeter, Digital	Fluke	77
LR	1002	Generator, AF/../UHF	R&S	SMPC
LR	1007	Attenuator	Narda	765-10
LR	1013	Counter Freq	HP	HP5385A
LR	1047	Radiocomm Analyzer	R&S	CMTA 54
LR	1079	Generator, AF/../UHF	R&S	SMHU56
LR	1123	Spectrum Analyzer	Advantest	R3271
LR	1134	Attenuator	Suhner	6820.17.A
LR	1136	Attenuator	Narda	6810.17.A
LR	1139	Attenuator	Narda	6810.17.A
LR	1169	Filter Band Pass	Trilithic	5VF250/500
LR	1170	Filter Band Pass	Trilithic	5VF500/1000
LR	1201	Attenuator	Narda	768-20
LR	1207	Crystal Detector	HP	HP8470B
LR	1239	Oscilloscope	Fluke	PM3392A
LR	1240	Generator, AF/../UHF	R&S	SMHU56
LR	1337	Spectrum Analyzer	R&S	FSEK 1088,3494,30
LR	1435	Climate Chamber	Vötsch	VC4060
LR	1442	Step Attenuator	Narda	Model 745-69
LR	1449	Power Sensor	HP	HP8481A


AIS Transponder
Nemko Comlab
°C
21.07.2004 12:00:00
C1
22.07.2004 15:38:00
Start measurements
HIGH TEMPERATURE
60
58
56
54
52
50
48
46
44
42
40
38
36
34
32
30
28
26
24
22
20
12:00
21.07.2004
18:00
21.07.2004
00:00
22.07.2004
06:00
22.07.2004
12:00
22.07.2004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Nemko Comlab
°C
22.07.2004 15:24:00
C1
23.07.2004 16:02:00
LOW TEMPERATURE
Start measurements
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
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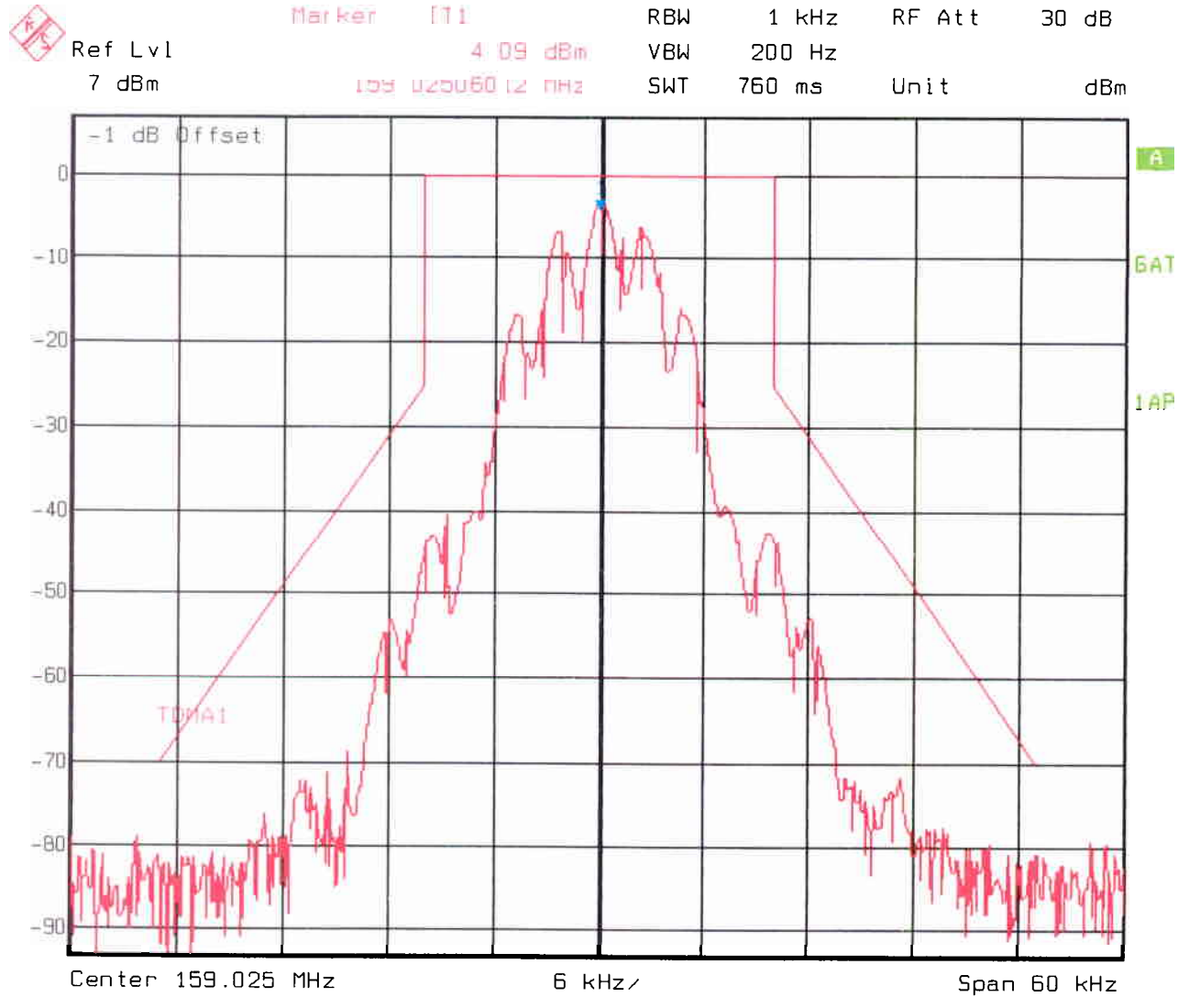
12:00
23.07.2004



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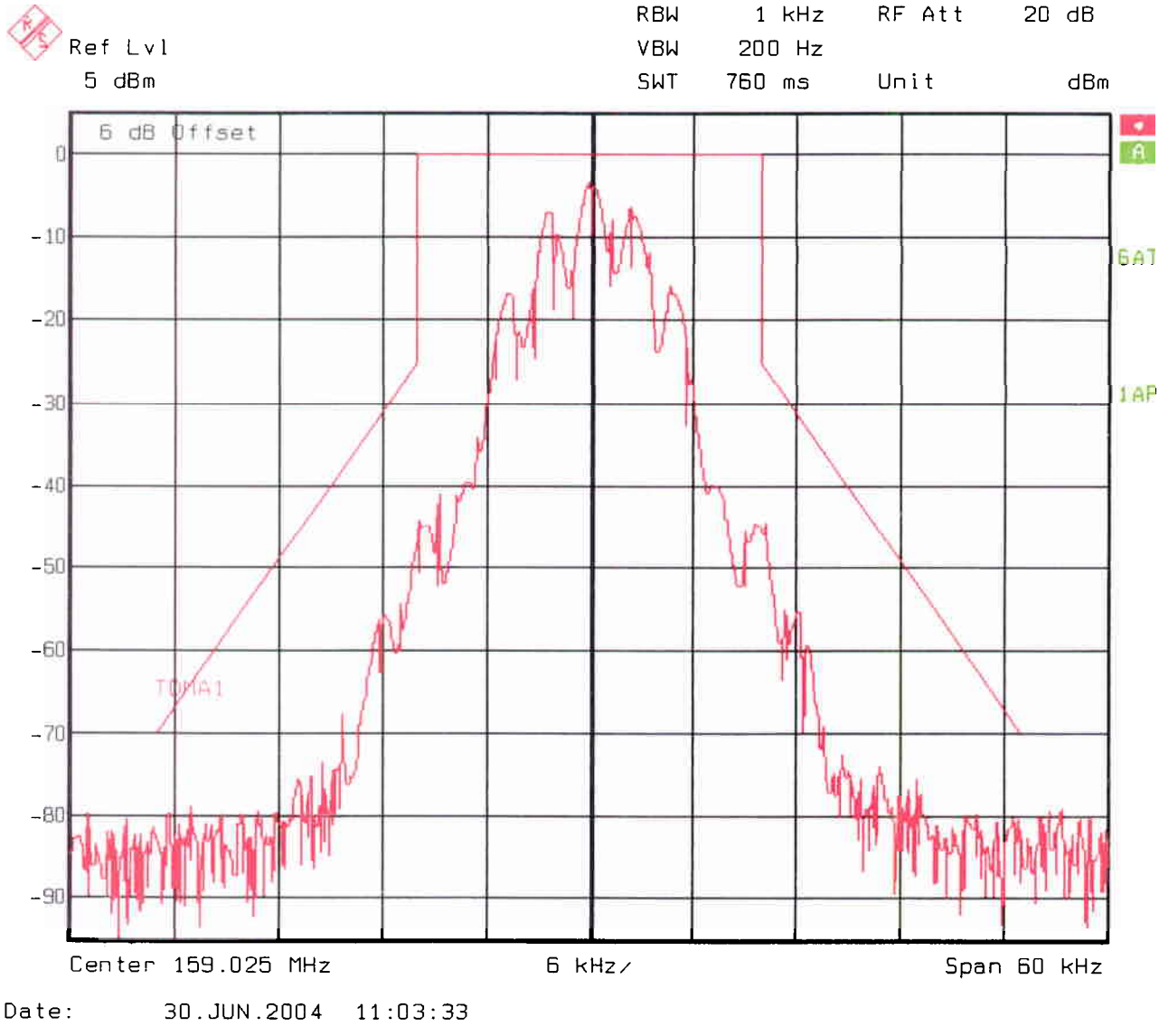

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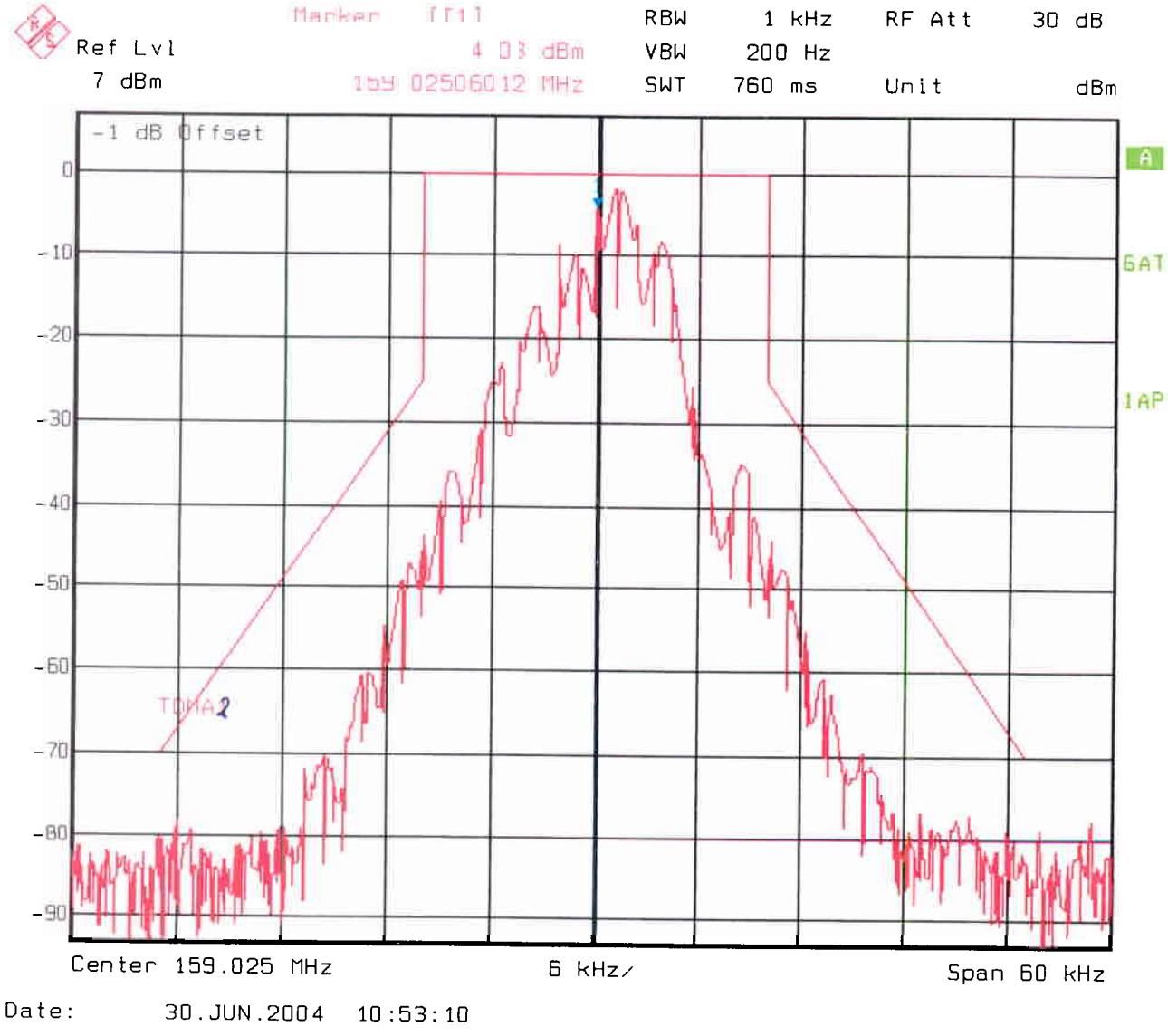
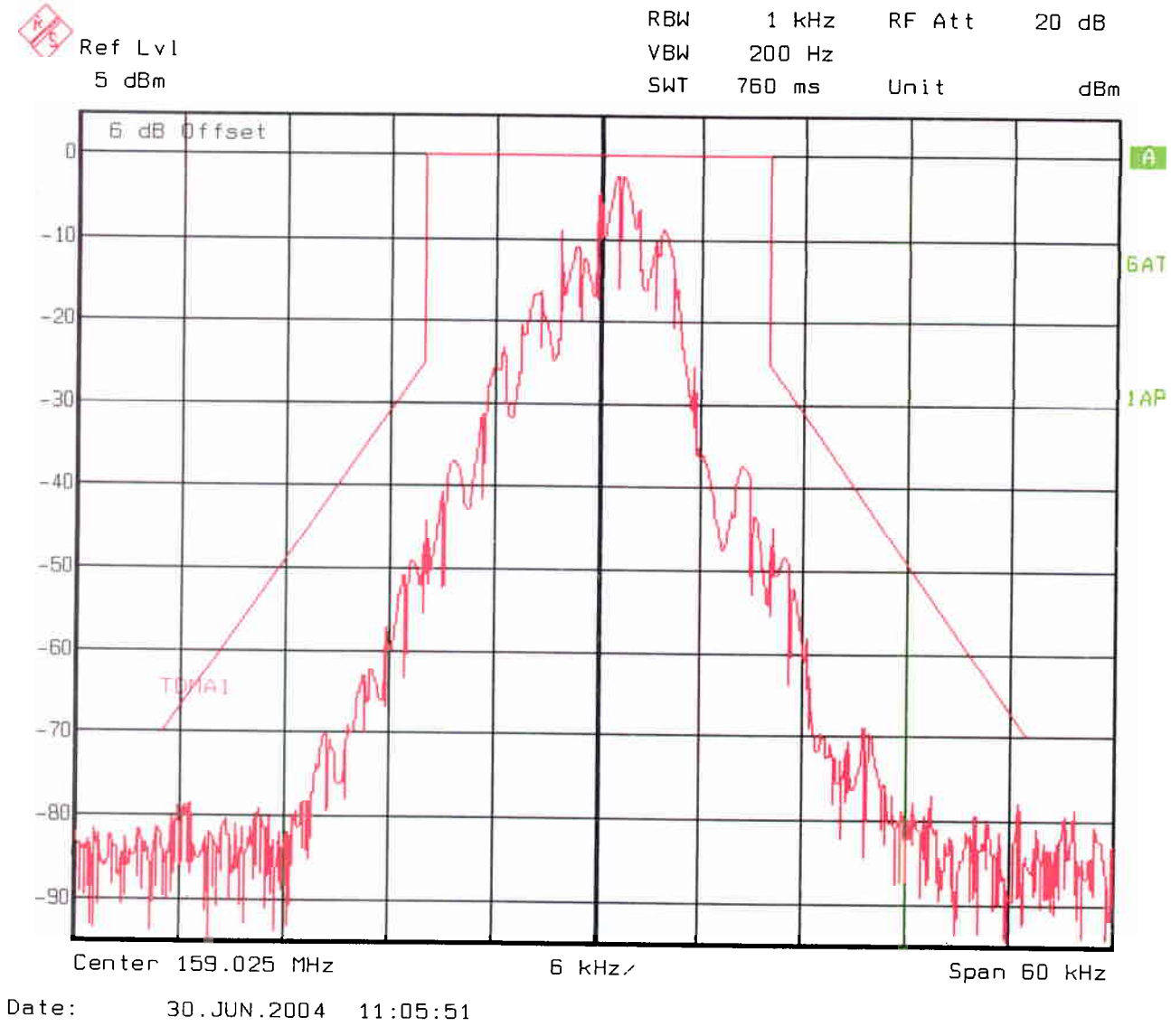

Ref Lvl
7 dBm
Marker [T1]
4.03 dBm
159.02506012 MHz
RBW 1 kHz
VBW 200 Hz
SWT 760 ms
RF Att 30 dB
Unit dBm
-1 dB Offset
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
A
GAT
IAP
TDMA2
Center 159.025 MHz
6 kHz/
Span 60 kHz
Date: 30.JUN.2004 10:53:10


Ref Lvl
5 dBm
RBW 1 kHz
VBW 200 Hz
SWT 760 ms
RF Att 20 dB
Unit dBm
6 dB Offset
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
TDMA1
A
GAT
1AP
Center 159.025 MHz
6 kHz/
Span 60 kHz
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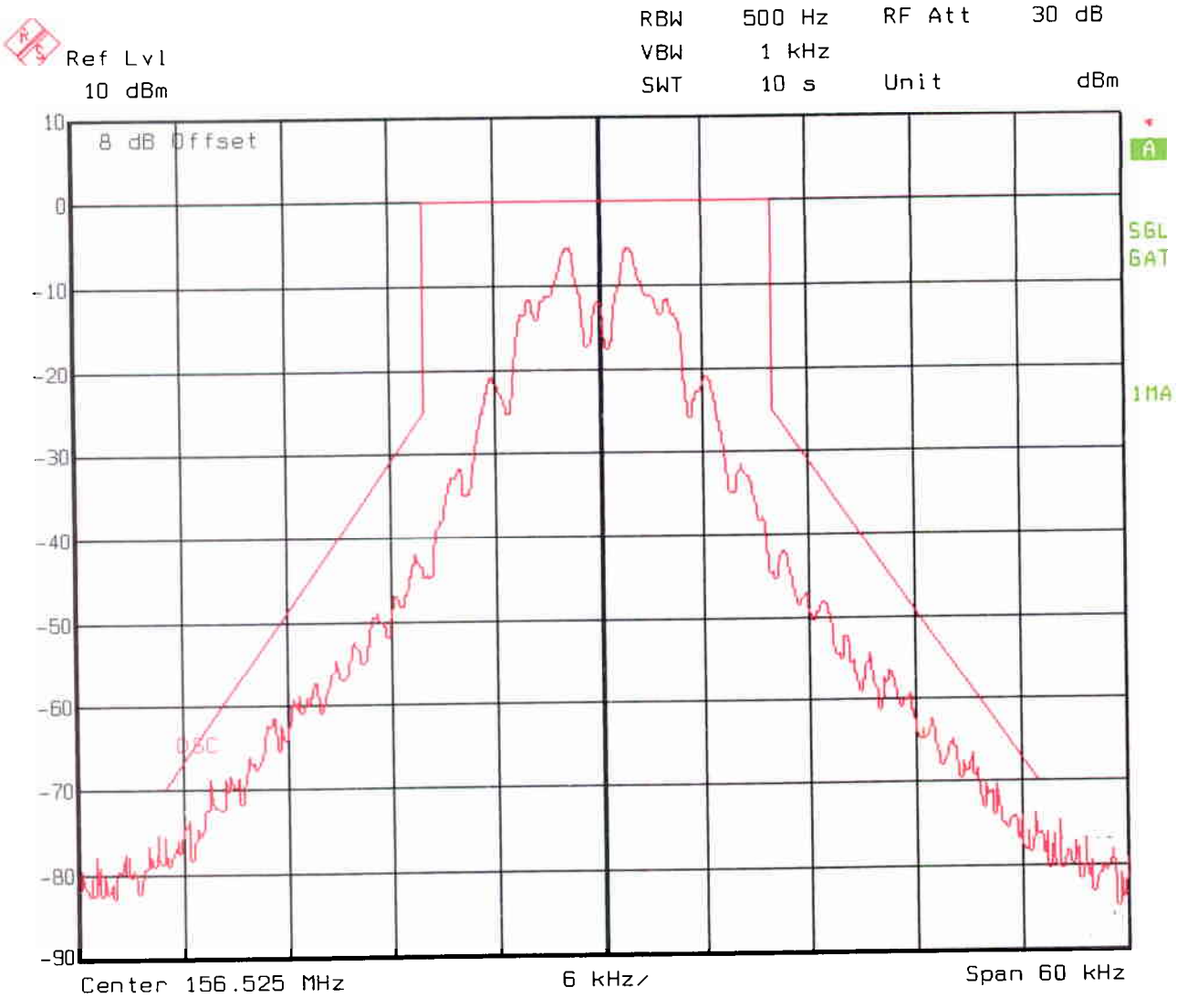

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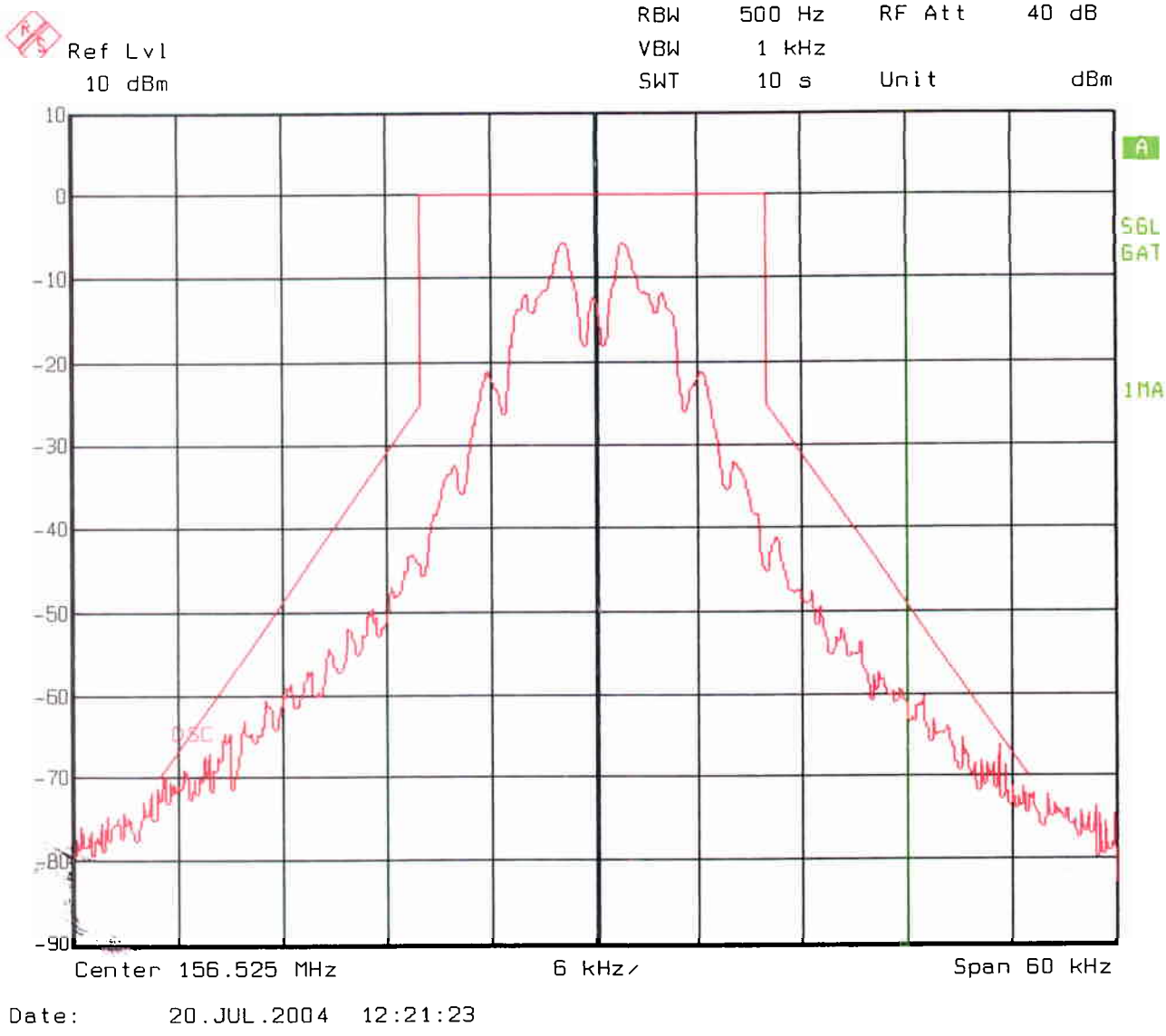
Ref Lvl
10 dBm
RBW 500 Hz
VBW 1 kHz
SWT 10 s
RF Att 40 dB
Unit dBm
A
SGL
GAT
1MA
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 156.525 MHz
6 kHz/
Span 60 kHz
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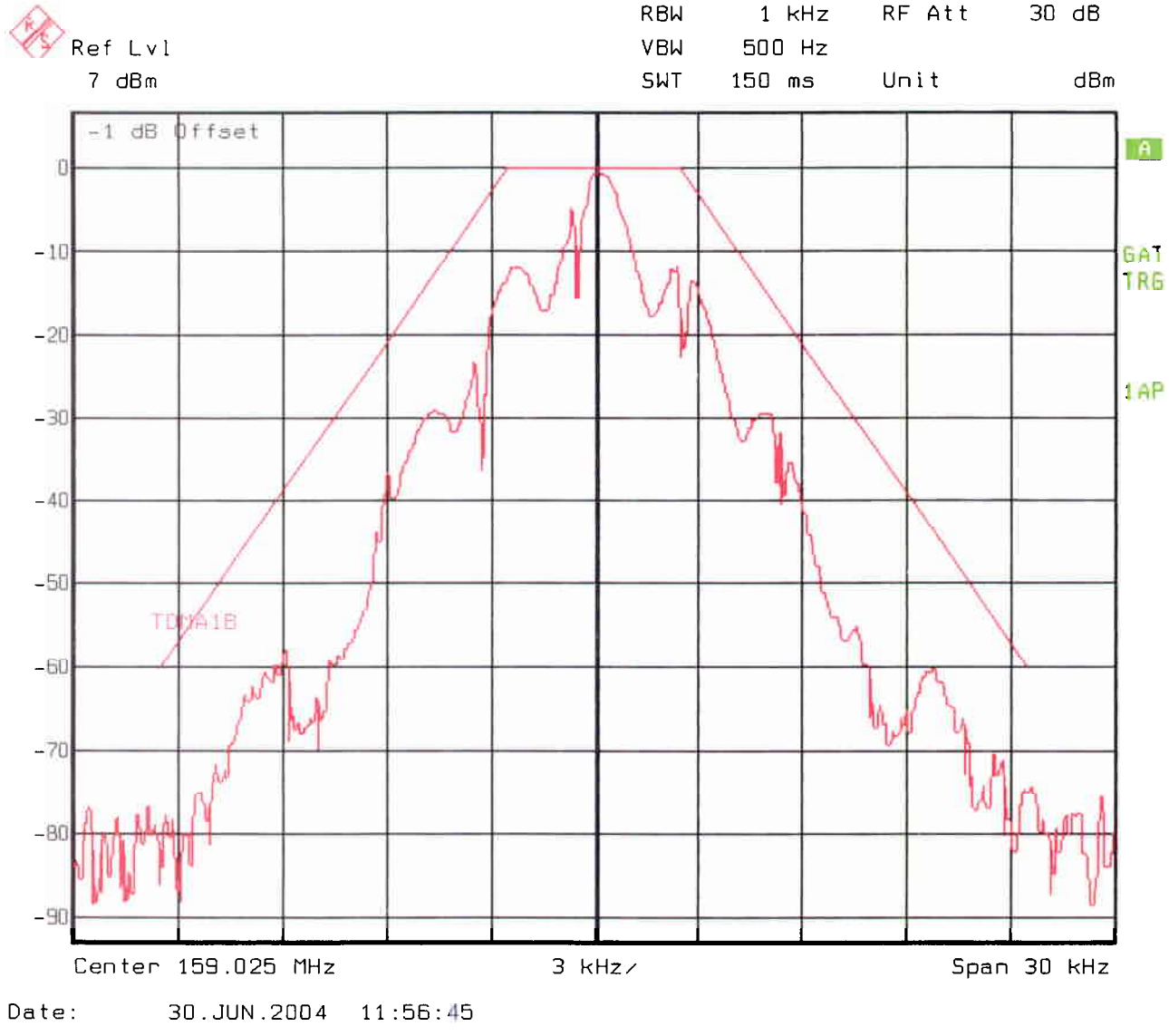
Ref Lvl
7 dBm
RBW 1 kHz
VBW 500 Hz
SWT 150 ms
RF Att 30 dB
Unit dBm
-1 dB Offset
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
A
GAT
TRG
1AP
TDMA1B
Center 159.025 MHz
3 kHz/
Span 30 kHz
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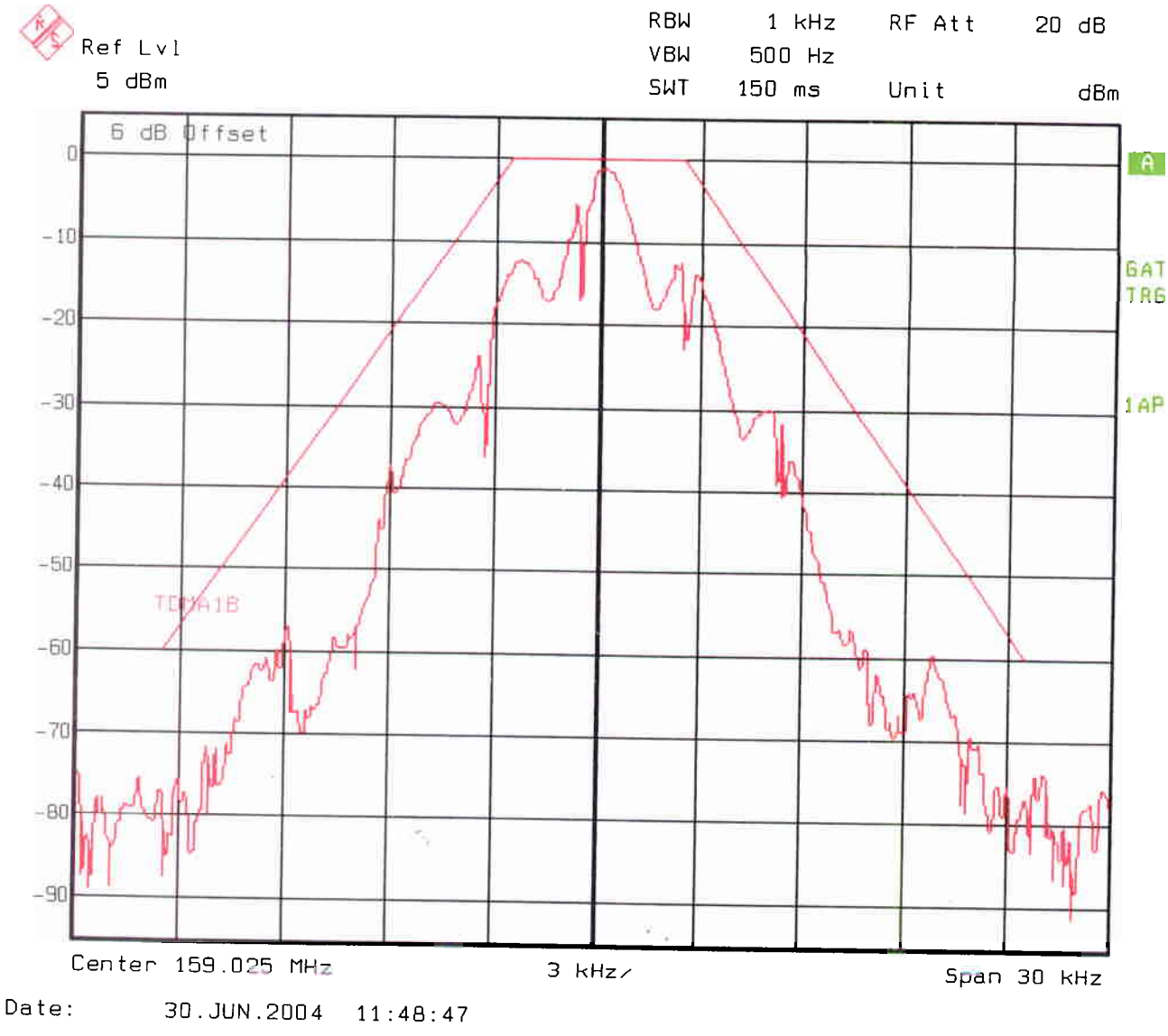

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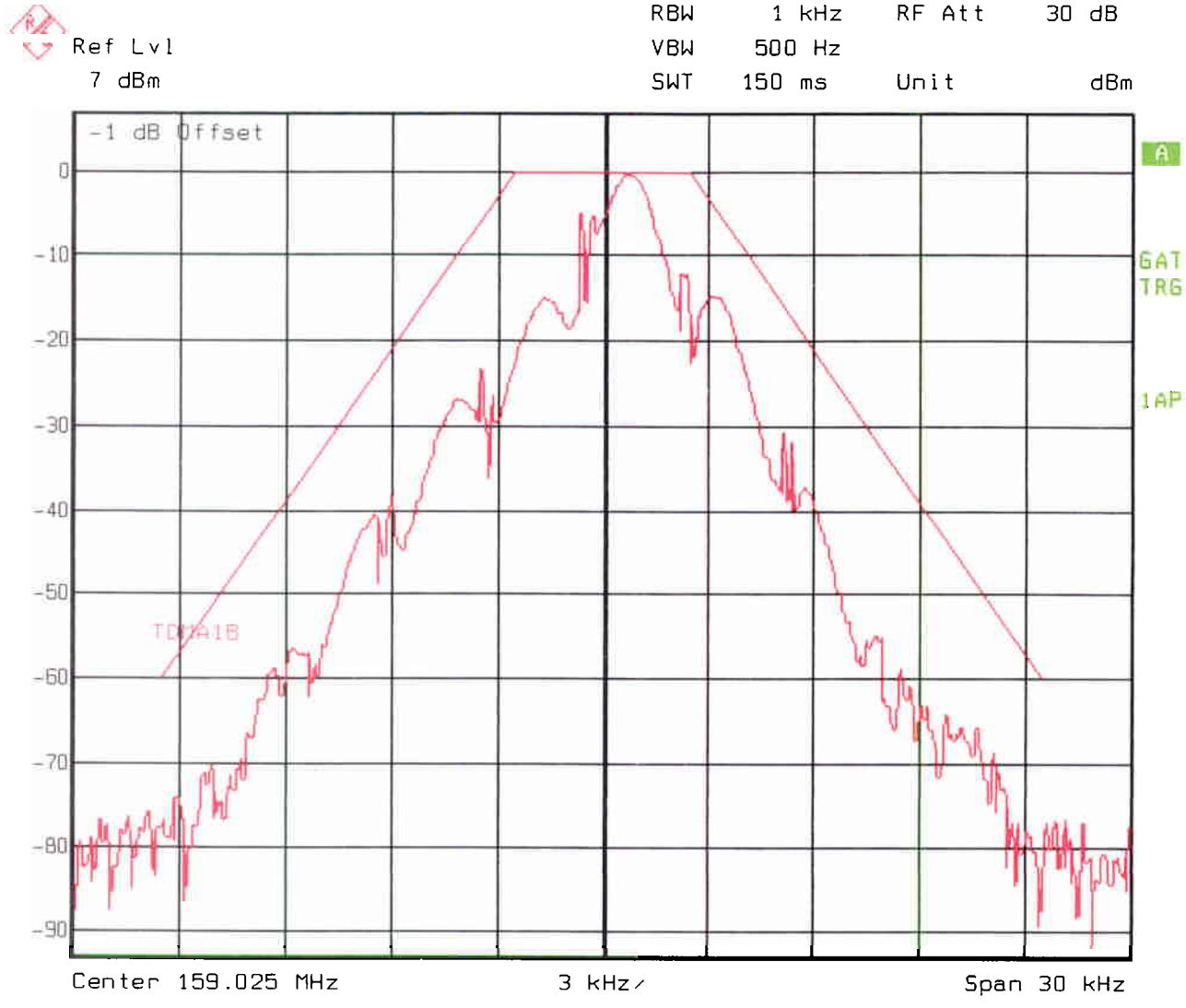

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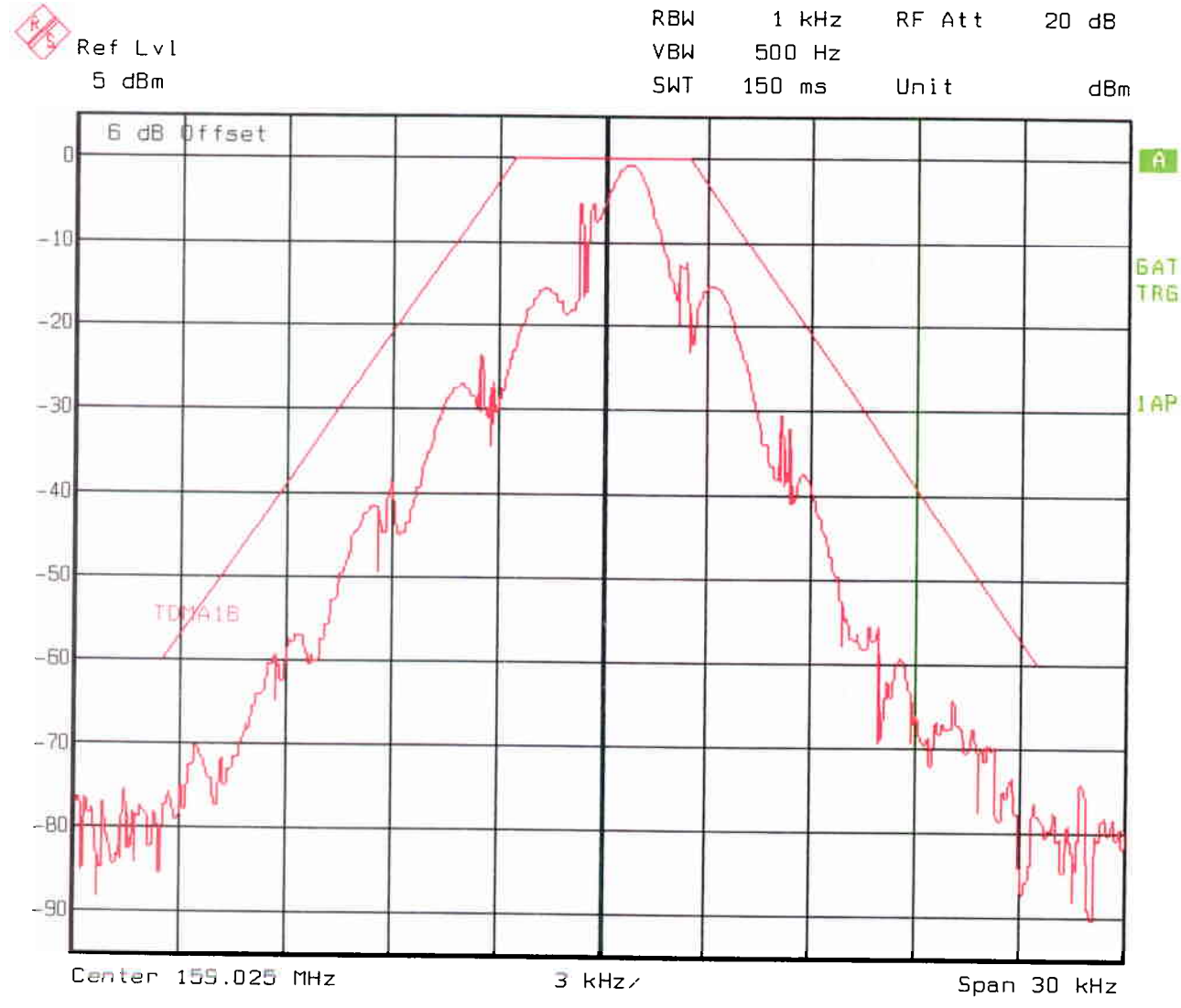

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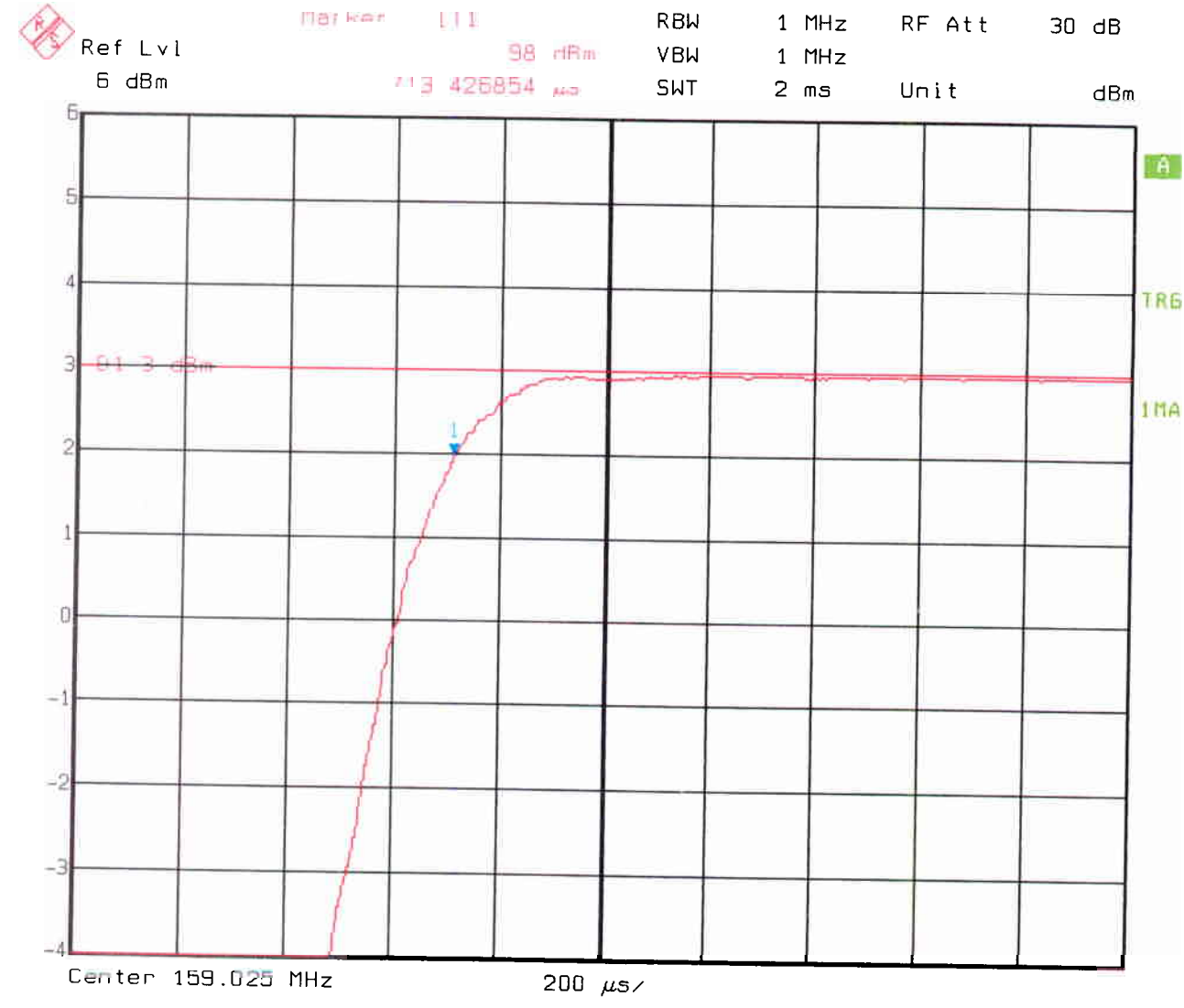

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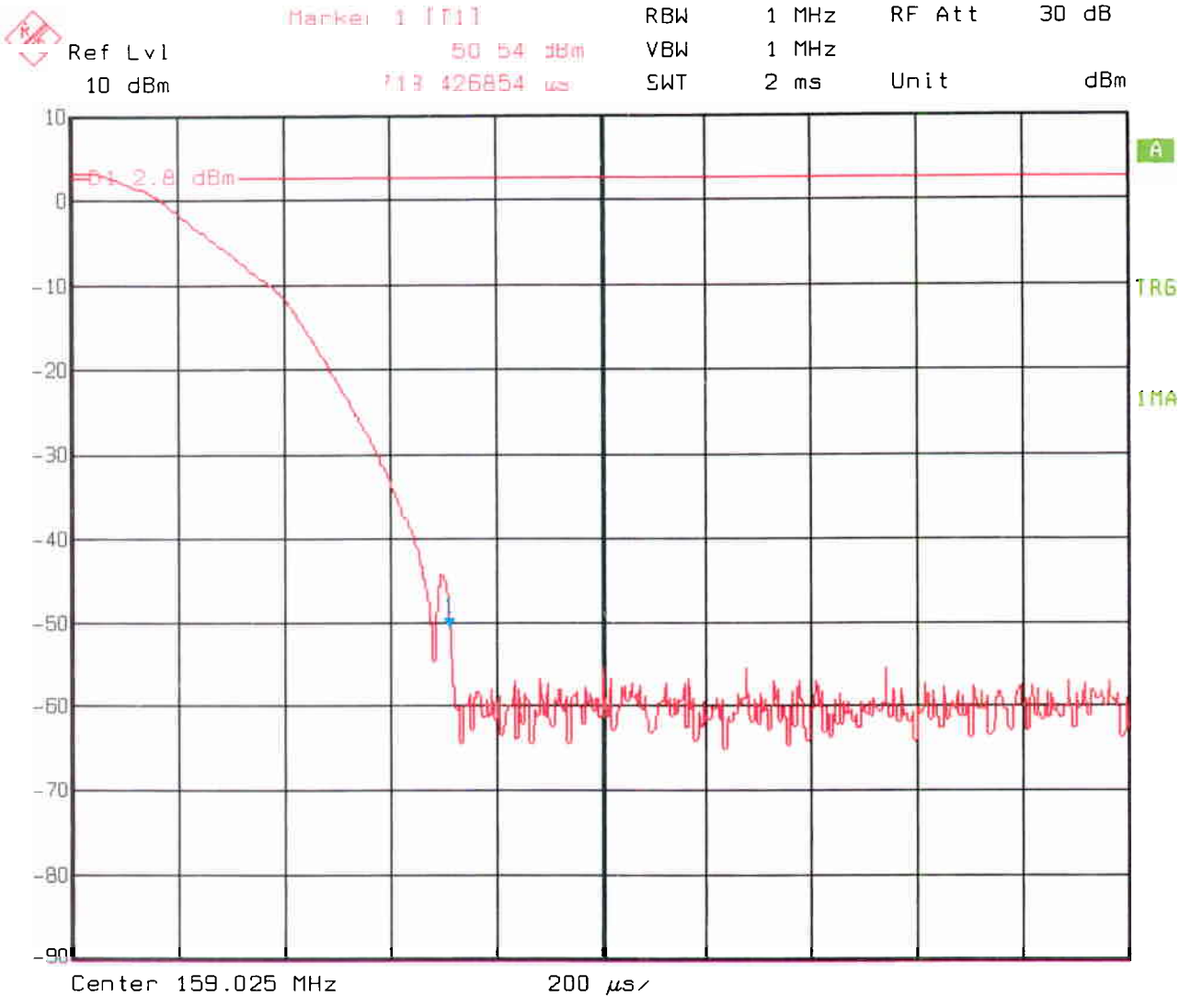

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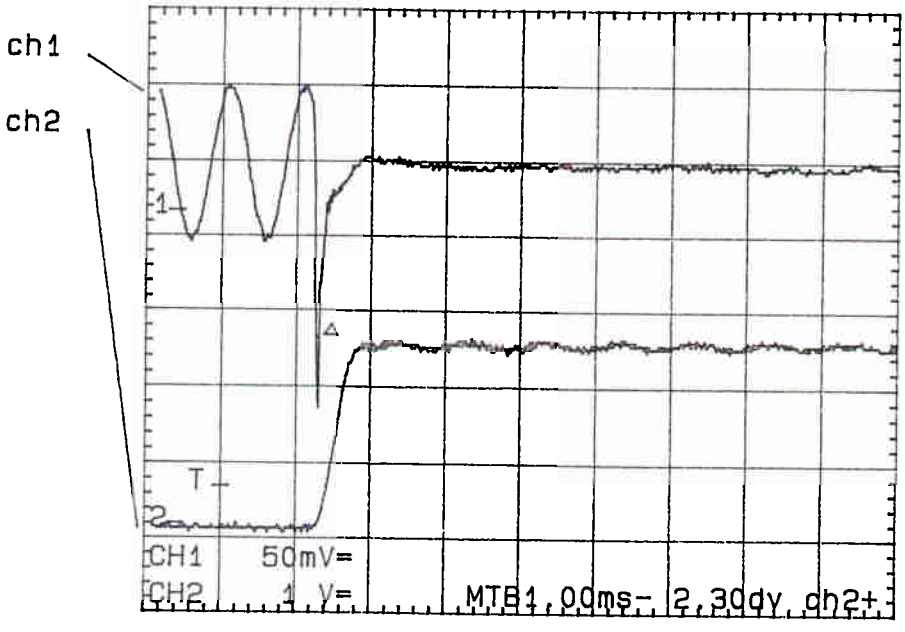
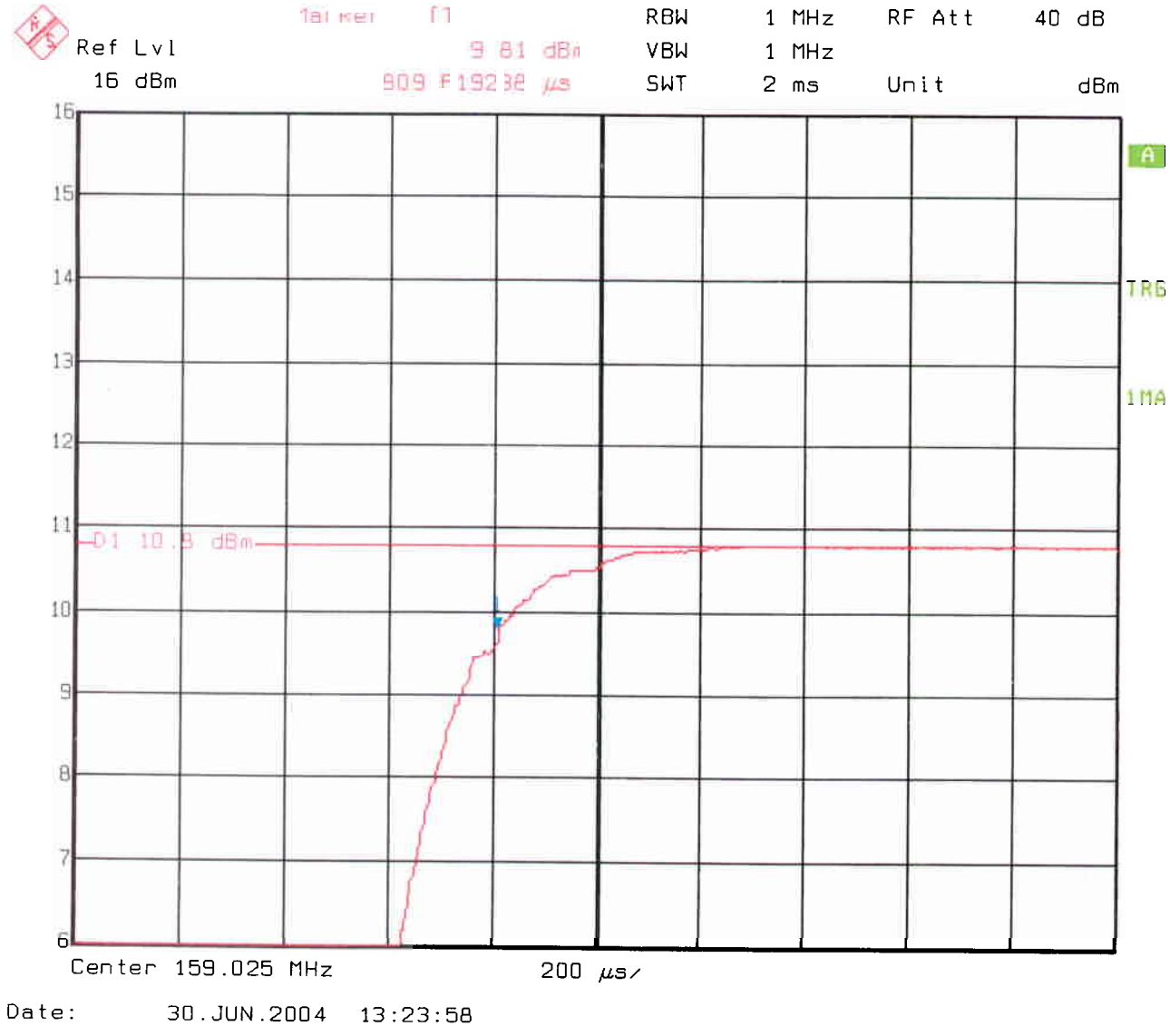
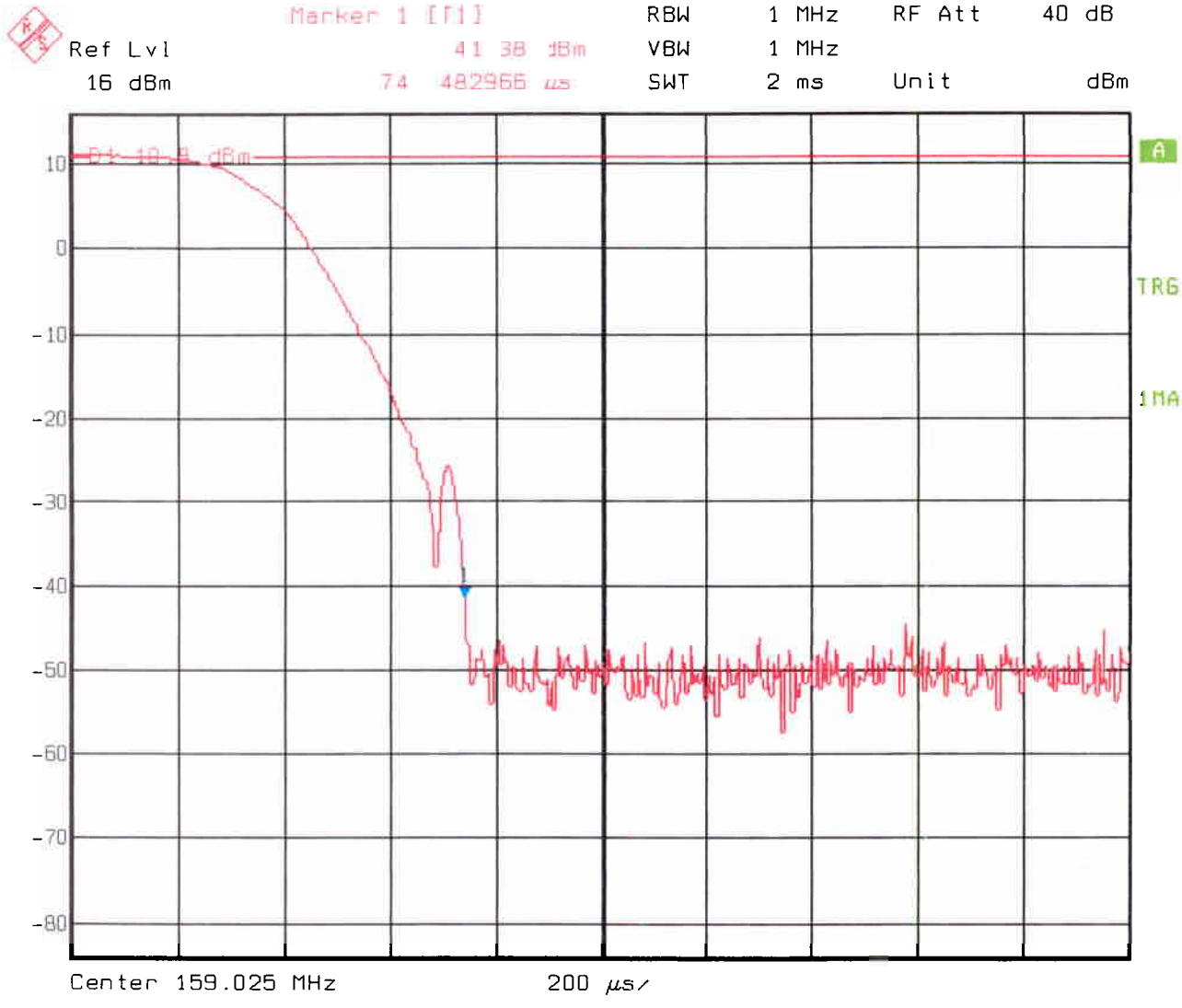
PM3392A, FLUKE incorporating PHILIPS T&M




Marker
Ref Lvl
16 dBm
RBW 1 MHz
VBW 1 MHz
SWT 2 ms
RF Att 40 dB
Unit dBm
A
TRG
1MA
D1 10.8 dBm
Center 159.025 MHz
200 µs/
Date: 30.JUN.2004 13:23:58



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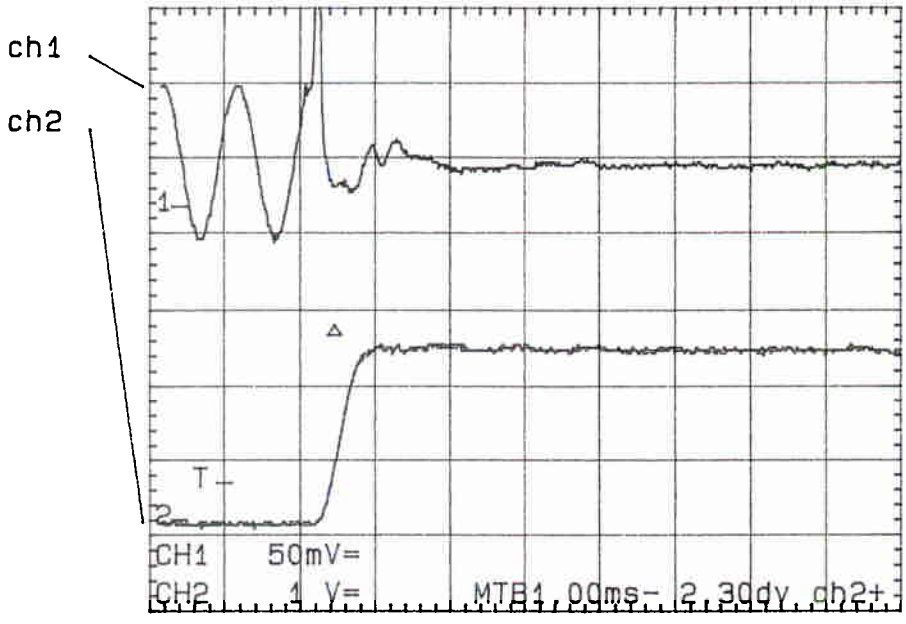
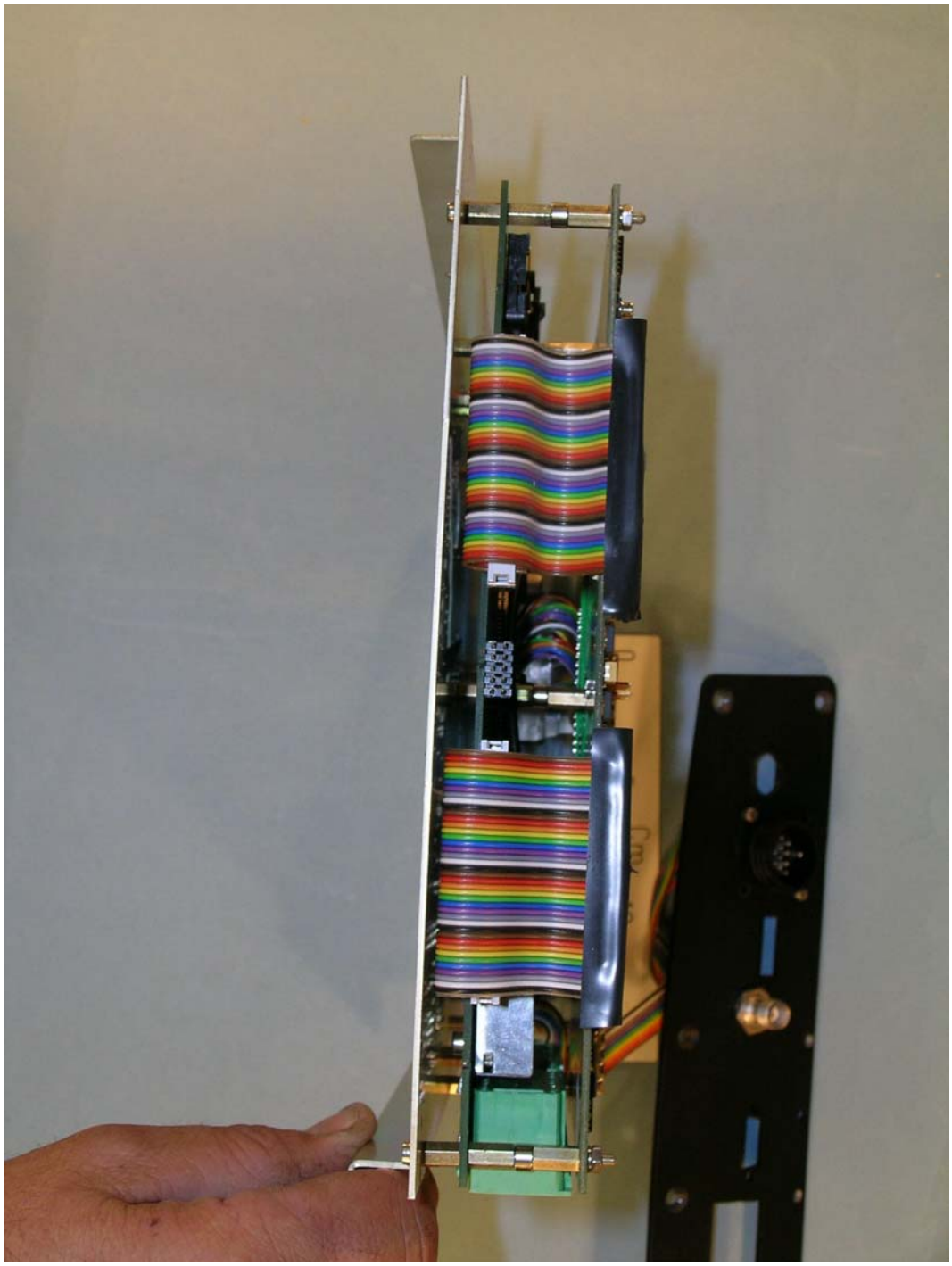


Simrad AI 80 AIS

Simrad AI 80 AIS



Simrad AI 80 AIS