PHOENIX TESTLAB

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Test Report

No.: U081185E1, 3rd version

Designation of equipment under test: AIS-A Transponder
AIS3410

Test Laboratory

for

"Safety of Electrical Equipment and Industrial Low-Voltage Devices as well as Environmental Tests"

accredited by
DATech in der TGA GmbH
in compliance with DIN EN ISO/IEC 17025
under
Reg. No. DAT-P-105/00-11

Testing body:	PHOENIX TESTLAB GmbH Königswinkel 10 D-32825 Blomberg
Applicant:	ATTINGIMUS Nachrichtentechnik GmbH &Co. KG Bismarckstrasse 15 D-38102 Braunschweig
Order number:	81185
Type of test:	Environmental simulation: - Vibration - Dry heat - Damp heat, cyclic - Cold
Method of measurement according to:	EN 60945: 2002 Maritime navigation and radiocommunication equipment and systems IEC 61993-2: 2006 According to: EN 60068-2-6: 2007 EN 60068-2-2: 2007 EN 60068-2-30: 2005 EN 60068-2-1: 2007

Equipment under test (EUT):	AIS-A Transponder
Type:	AIS3410

PTL No.	EUT No.
81185 – 1	1

Manufacturer:	SAM Electronics GmbH
Date equipment was received:	03 September 2008
Test specifications:	EN 60945: 2002 Maritime navigation and radiocommunication equipment and systems IEC 61993-2: 2006 According to: EN 60068-2-6: 2007 EN 60068-2-2: 2007 EN 60068-2-30: 2005 EN 60068-2-1: 2007
Applicant/Client represented during the test by following person(s):	---
Place of test:	PHOENIX TESTLAB GmbH, Blomberg
Date of test:	03 September 2008 to 01 December 2008

Test result: The complete test results are present in the following.

The test requirements are **conformed** by the EUT.

The final valuation of the test will be carried out by the applicant and not by the testing body, PHOENIX TESTLAB GmbH.

EUT No.	Test	Pass
1	Vibration	Yes
1	Dry heat	Yes
1	Damp heat, cyclic	Yes
1	Cold 1	No [1)]
1	Cold 2	Yes

[1)] In consultation after failed test “Cold 1” the EUT was send to the applicant for inspection! The result of the inspection see page 15.

Blomberg, 05 March 2009

Testengineer: L. Diedrichs

Authorized reviewer: U. Sauerländer

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1 Test specifications and test conditions

1.1 Vibration, sinusoidal (chapter 8.7, EN 60945)

Test Fc: Vibration, sinusoidal / EN 60068-2-6

This test determines the ability of equipment to withstand vibration without resulting in mechanical weakness or degradation in performance. The test simulates the effect of vibration induced in a ship's hull by its propellor and machinery. This is generally at frequencies of up to 13 Hz and predominantly vertical. The tests at higher frequencies simulate the effect of slamming which occurs in irregular stormy seas, and is predominantly horizontal. The test does not simulate the effect of regular seas giving the translational components of surging, swaying and heaving, and the corresponding rotational components of rolling, pitching and yawing which generally produce accelerations too small to be of consequence to electronic equipment.

The EUT, complete with any shock and vibration absorbers with which it is provided, shall be clamped to the vibration table by its normal means of support and in its normal attitude. The EUT may be resiliently suspended to compensate for weight not capable of being withstood by the vibration table. Provision may be made to reduce or nullify any adverse effect on EUT performance which might be caused by the presence of an electromagnetic field due to the vibration unit.

A resonance search shall be carried out throughout the test. If any resonance of the EUT has Q ≥ 5 measured relative to the base of the vibration table, the EUT shall be subjected to a vibration endurance test at each resonant frequency at the vibration level specified in the test with duration of 2 h.

If no resonance with Q ≥ 5 occurs, the endurance test shall be carried out at one single observed frequency. If no resonance occurred, the endurance test shall be carried out at a frequency of 30 Hz.

Performance check(s) shall be carried out at least once during each endurance test period, and once before the end of each endurance test period.

Severity for protected equipment:

Frequency range:	2 Hz to 100 Hz
Cross-over frequency:	13.2 Hz
Displacement amplitude below the cross-over frequency:	+/- 1.00 mm
Acceleration amplitude above the cross-over frequency:	7 m/s²
Sweep rate:	0.5 Oct. / min.
Test duration:	See test result
Axis:	X, Y, Z

1.2 Dry heat storage (chapter 8.2.1, EN 60945)

Test B: Dry heat / EN 60068-2-2

To simulate the effects of temperature stress on equipment in the non-operating (un-powered) mode. A temperature of +70 °C is the maximum likely to be encountered in enclosed spaces on ships and in equipment exposed to the full effects of solar radiation in ports.
The EUT shall be placed in a chamber at normal room temperature and relative humidity. The temperature shall then be raised to and maintained at +70 °C ± 3 °C, for a period of 10 h to 16 h.
At the end of the test, the EUT shall be returned to normal environmental conditions and then subjected to a performance check as specified in the relevant equipment standard.

Severity:

Temperature:	+ 70 °C ± 3 °C
Duration:	10 to 16 hours

1.3 Dry heat (chapter 8.2.2, EN 60945)

Test B: Dry heat / EN 60068-2-2

This test determines the ability of equipments to be operated at high ambient temperatures and to operate through temperature changes. The reasonable maximum air temperature likely to be encountered over the sea is + 32 °C and the maximum solar gain at sea is + 23 °C giving + 55 °C as the maximum temperature likely to be encountered by ships at sea.

The EUT shall be placed in a chamber at normal room temperature and relative humidity. The EUT and, if appropriate, any climatic control devices with which it is provided shall then be switched on. The temperature shall then be raised to and maintained at + 55 °C ± 3 °C. At the end of a soak period of 10 h to 16 h at + 55 °C ± 3 °C, the EUT shall be subjected to a performance test as specified in the relevant equipment standard. The temperature of the chamber shall be maintained at + 55 °C ± 3 °C during the whole performance test period.
At the end of the test, the EUT shall be returned to normal environmental conditions or to those required at the start of the next test.

Severity for protected equipment:

Temperature:	+ 55 °C ± 3 °C
Duration:	10 to 16 hours

1.4 Damp heat (chapter 8.3, EN 60945)

Test Db: Damp heat cyclic / EN 60068-2-30

This test determines the ability of equipments to be operated under conditions of high humidity. A single cycle is used with an upper temperature limit of + 40 °C which is the maximum that occurs in the earth's surface atmosphere with a relative humidity of 95 %.
The EUT shall be placed in a chamber at normal room temperature and relative humidity. The temperature shall then be raised to + 40 °C ± 2 °C, and the relative humidity raised to 93 % ± 3 % over a period of 3 h ± 0,5 h. These conditions shall be maintained for a period of 10 h to 16 h. Any climatic control devices provided in the EUT may be switched on at the conclusion of this period.
The EUT shall be switched on 30 min later, or after such period as agreed by the manufacturer, and shall be kept operational for at least 2 h during which period the EUT shall be subjected to a performance check as specified in the relevant equipment standard. The temperature and relative humidity of the chamber shall be maintained as specified during the whole test period.
At the end of the test period and with the EUT still in the chamber, the chamber shall be brought to room temperature in not less than 1 h.
At the end of the test the EUT shall be returned to normal environmental conditions or to those required at the start of the next test.

Severity for protected equipment:

Temperature:	+ 40 °C ± 2 °C
Relative humidity:	93 % ± 3 %
Duration:	10 to 16 hours

1.5 Cold (chapter 8.4.2.4, EN 60945)

Test A: Cold / EN 60068-2-1

These tests determine the ability of equipment to be operated at low temperatures. They also allow equipment to demonstrate an ability to start up at low ambient temperatures.

The EUT shall be placed in a chamber at normal room temperature and relative humidity. The temperature shall then be reduced to, and maintained at
– 15 °C ± 3 °C, for a period of 10 h to 16 h. Any climatic control devices provided in the EUT may be switched on at the conclusion of this period.
The EUT shall be switched on 30 min later, or after such period as agreed by the manufacturer, and shall be kept operational for at least 2 h during which period the EUT shall be subjected to a performance check as specified in the relevant equipment standard. The temperature of the chamber shall be maintained at
– 15 °C ± 3 °C during the whole test period.

At the end of the test the EUT shall be returned to normal environmental conditions or to those required at the start of the next test.

Severity for protected equipment:

Temperature:	- 15 °C ± 3 °C
Duration:	10 to 16 hours

1.6 Operating states and test set-up

During the tests the EUT is connected and operating.

For operation and function testing during the tests by the client a monitoring PC and control set-up is made available. A description about the control set-up is given by the applicant and shown in the following:

Monitoring PC running two instances of SAMaisTranCfg for displaying and decoding the PDP messages. SAMaisTranCfg shows the data like the AISterm program with the addition of a list of the received transponders (MKD-like) marked with the last receiption time.

The monitoring checks the following ports of the EUT:

- Primary Display Port as an RS-422 I/O
- VHF-Link (Rx and Tx)
- GPS receiver function
- LAN communications port including the Media Converter

When applicable a GPS antenna or a GPS simulator were connected to the EUT. By watching the outputs of the SAMaisTranCfg program instances it can be verified that the EUT and the monitoring transponder receive each other with the expected data content (in this case a valid position of the EUT). This also certifies that the RS-422 Tx line of the EUT is working. An additional query for the static data of the EUT with the expected answer verfies that the receiption of RS-422 data is working.

For some tests an additional PC was available running the program sen_sim.exe which provides a source of NMEA position data. These were sent to a sensor port of the EUT to additionally check the reception of data over a RS-422 port.

The LAN was checked by sending ping packets to the EUT and checking that the once per second UDP packets from the EUT were present. For the test of the RJ45-LAN port this is connected directly to the monitoring PC without the media converter. If all these tests show the expected results the performance check is passed.

During and after the tests there shall be no damages or malfunctions.

Definition of the functions of the monitoring and their tolerances:

- Optical test for mechanical stability
- Control of the function
- Performance check 1
- Performance check 2

Performance check 1:	Normal power supply 24 V DC
Performance check 2:	Power supply + 30 % (31.2 V DC)
	Power supply - 10 % (21.6 V DC)

Note: In agreement with the client a performance test wasn't execute!

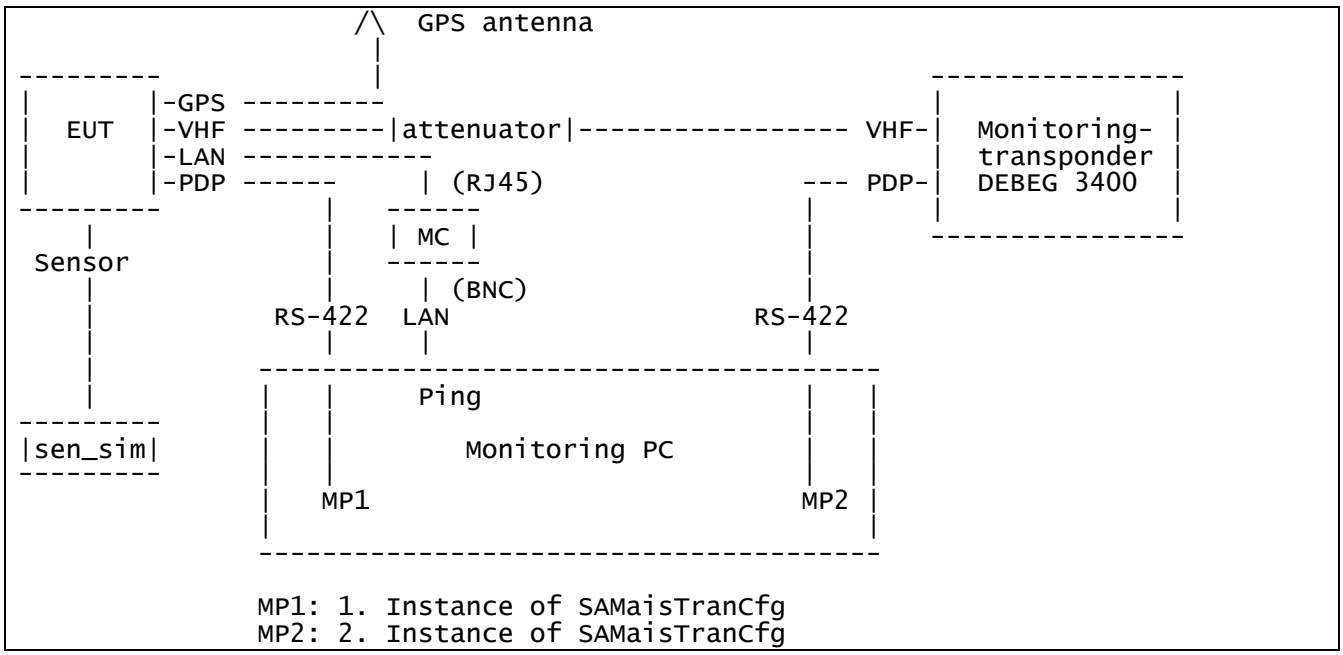


Figure 1: Test set-up configuration

2 Test performance and test results

2.1 Test performance

The tests were carried out as follows:

Test:
Vibration sinusoidal x-axis
Performance check 1
Vibration sinusoidal y-axis
Performance check 1
Vibration sinusoidal z-axis
Performance check 1
Dry heat storage [1)]
Performance check 1
Performance check 2
Dry heat
Performance check 1
Performance check 2
Damp heat
Performance check 1
Performance check 2
Cold (cycle 1)
Performance check 1
Performance check 2
Cold (cycle 2)
Performance check 1
Performance check 2

[1)] The dry heat storage test was executed but not designated for protected equipments!

2.2 Test results

Definition of the functions of the monitoring and their tolerances:

- Optical test for mechanical stability
- Control of the function
- Performance check 1
- Performance check 2

2.2.1 Vibration sinusoidal

EUT	Axis	Frequency	Acceleration	Test duration	Pass
1	X	100 Hz	7 m/s²	2 h	Yes
1	Y	100 Hz	7 m/s²	2 h	Yes
1	Z	85.15 Hz	7 m/s²	2 h	Yes

Note: Diagrams of resonance search see chapter 5, page 24 to 31.

2.2.2 Dry heat storage

EUT	Temperature	Test duration	Pass
1	+ 70 °C ± 3 °C	16 h	Yes

2.2.3 Dry heat

EUT	Temperature	Test duration	Pass
1	+ 55 °C ± 3 °C	16 h	Yes

2.2.4 Damp heat

EUT	Temperature	Relative humidity	Test duration	Pass
1	+ 40 °C ± 2 °C	93 % ± 3 %	16 h	Yes

2.2.5 Cold

Cycle 1:

EUT	Temperature	Test duration	Pass
1	- 15 °C ± 3 °C	16 h	No [1)]

Note: *The final evaluation of the EUTs will be carried out by the client and not by the testing body, PHOENIX TESTLAB GmbH.*

Cycle 2:

EUT	Temperature	Test duration	Pass
1	- 15 °C ± 3 °C	16 h	Yes [2)]

Note: *The final evaluation of the EUTs will be carried out by the client and not by the testing body, PHOENIX TESTLAB GmbH.*

[1)] During the test a functional test of the EUT wasn't possible!

[2)] Before cold cycle 2 the EUT was repaired by the applicant! A capacitor of the oscillator for serial interface modified from 22pF to 56pF!

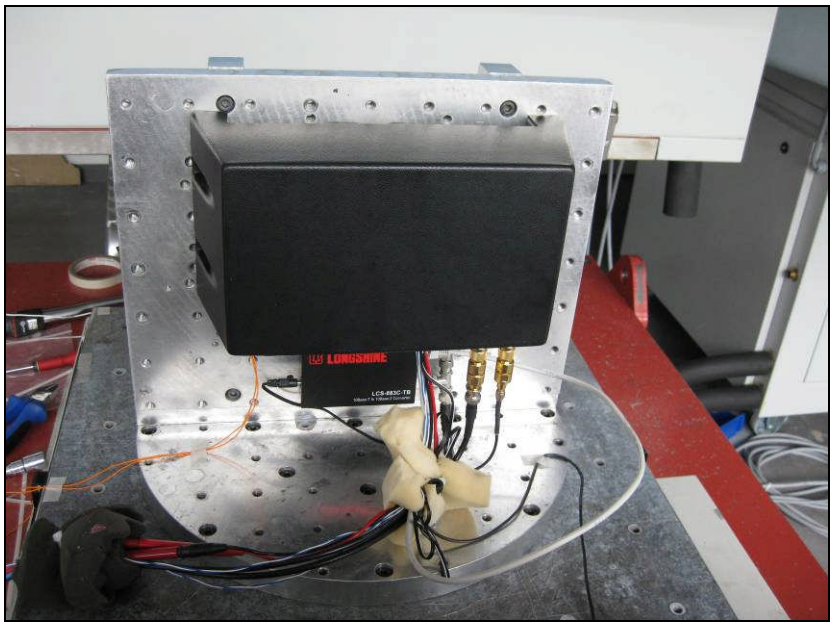
3 List of measurement equipment

Measurement equipment	PM No.
Shaker LDS V850-440 LPT 600	490082
Accelerometer	480610
Accelerometer	480611
Accelerometer	490178
Accelerometer	490179
Attenuator	1302947-0
Attenuator	410112
Attenuator	410126
Attenuator	410124
Attenuator	410113
Attenuator	480264
Attenuator	480265
Equipment provided by the applicant	PM No.
Monitoring Desktop PC	---
AIS Receiver	---
LONGSHINE media translator LCS-883C-TB 10Base-T to 10Base-2 Converter (RJ45-LAN to BNC-LAN)	---
Monitoring transponder DEBEG 3400	---
RF power attenuator 60 dB	---
GPS antenna P/N 1915 AB/K	---

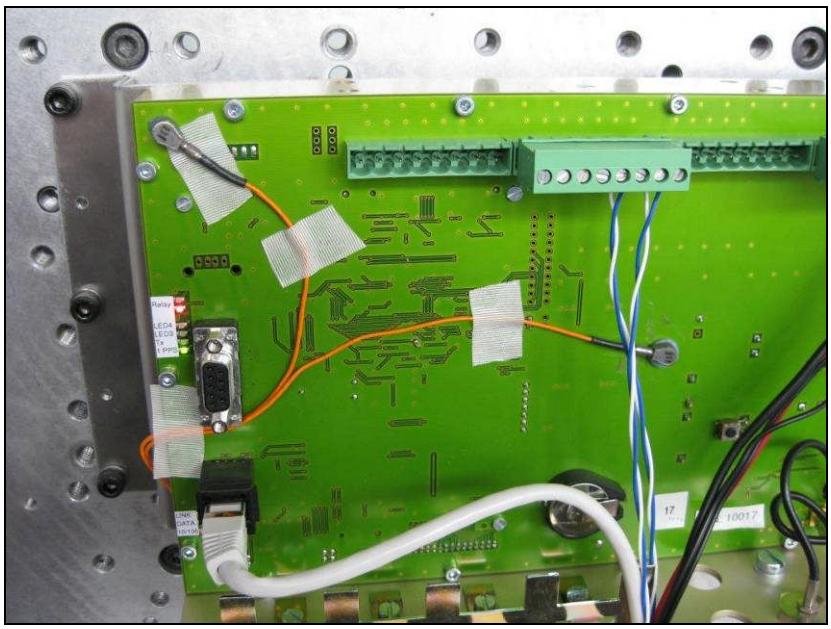
4 Pictures

Picture 1: Test set-up monitoring

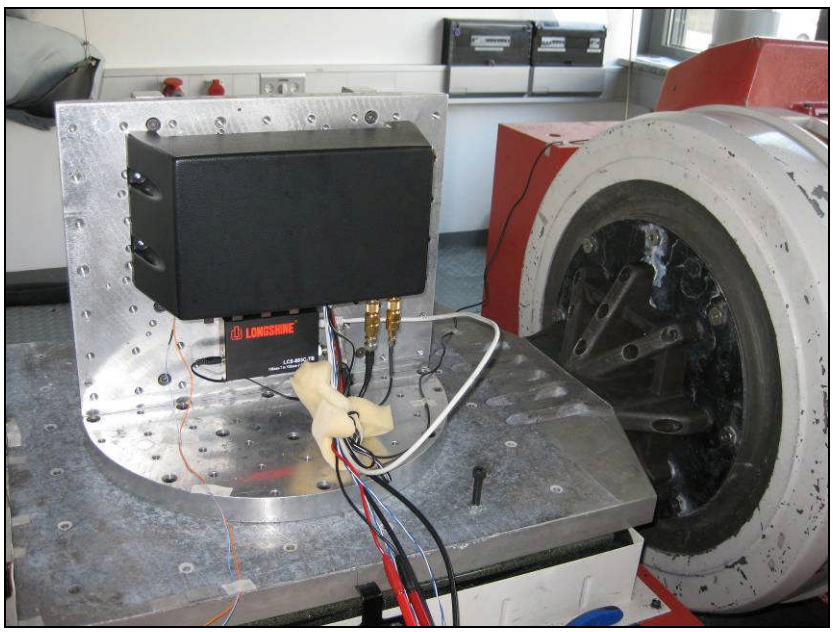
Picture 2: Test set-up vibration x-axis



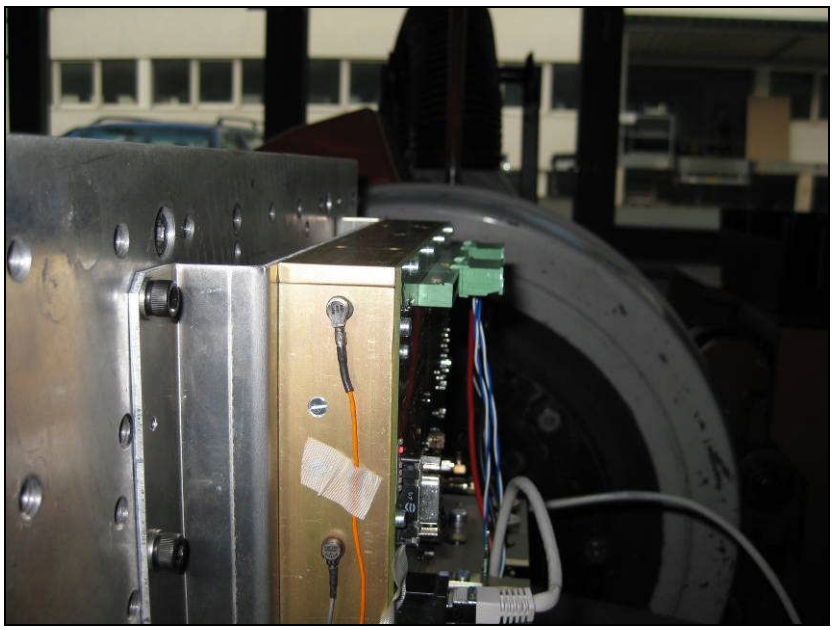
Picture 3: Position of resonance accelerometer, vibration x-axis



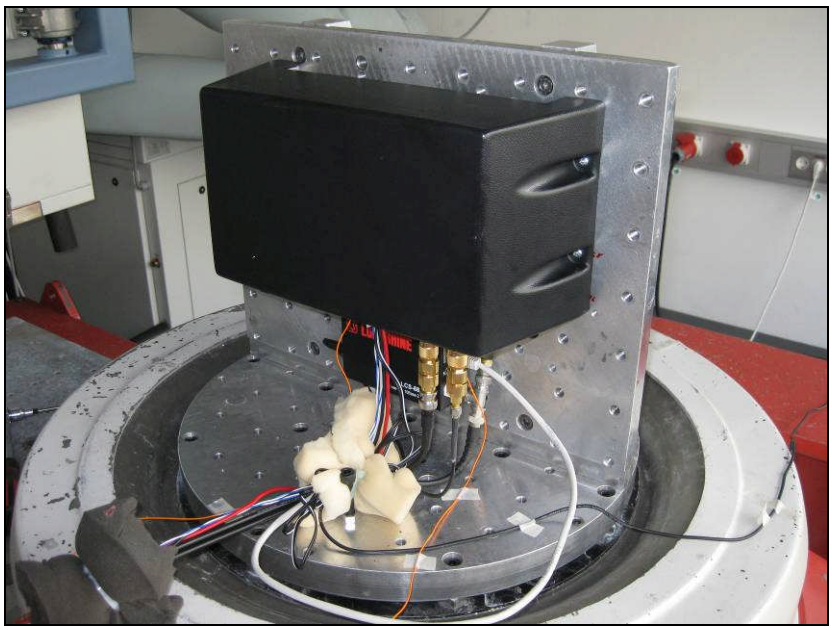
Picture 4: Test set-up vibration y-axis



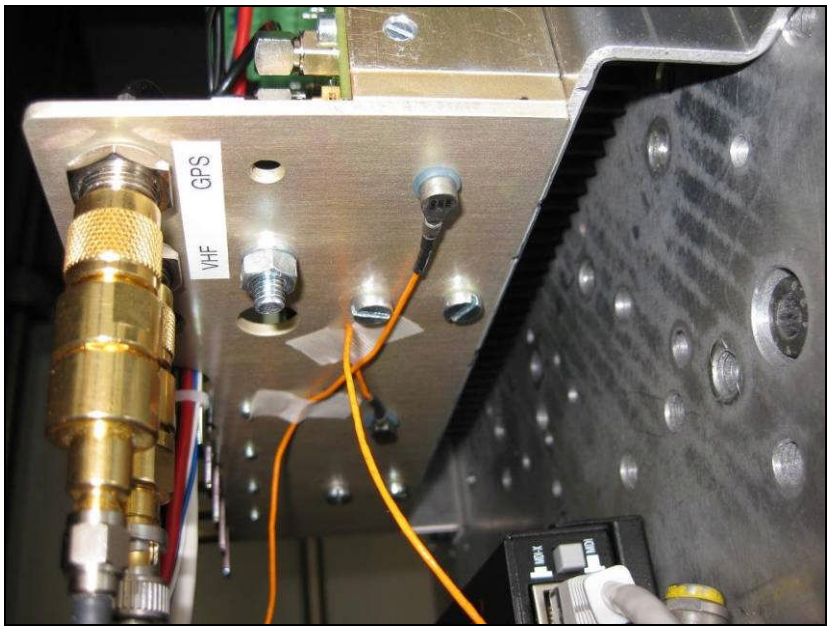
Picture 5: Position of resonance accelerometer vibration y-axis



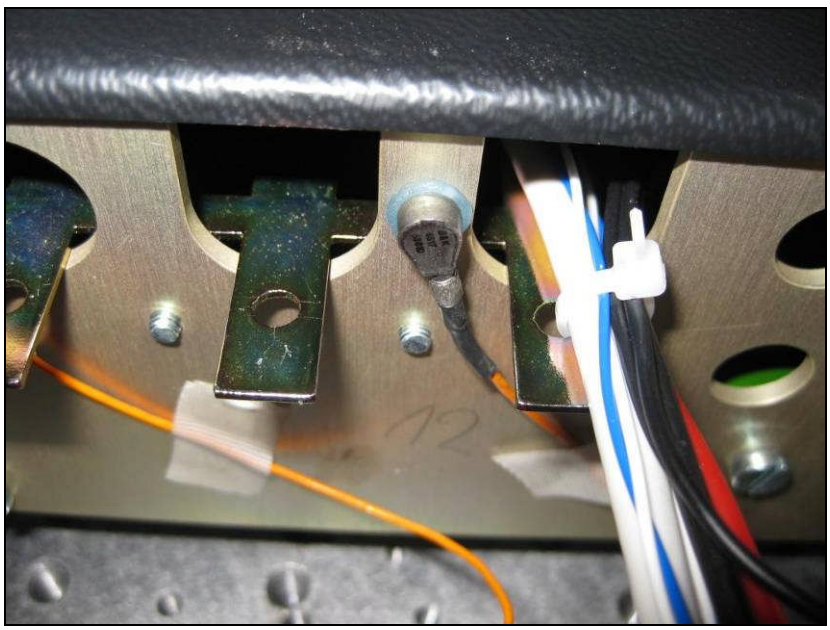
Picture 6: Test set-up vibration z-axis



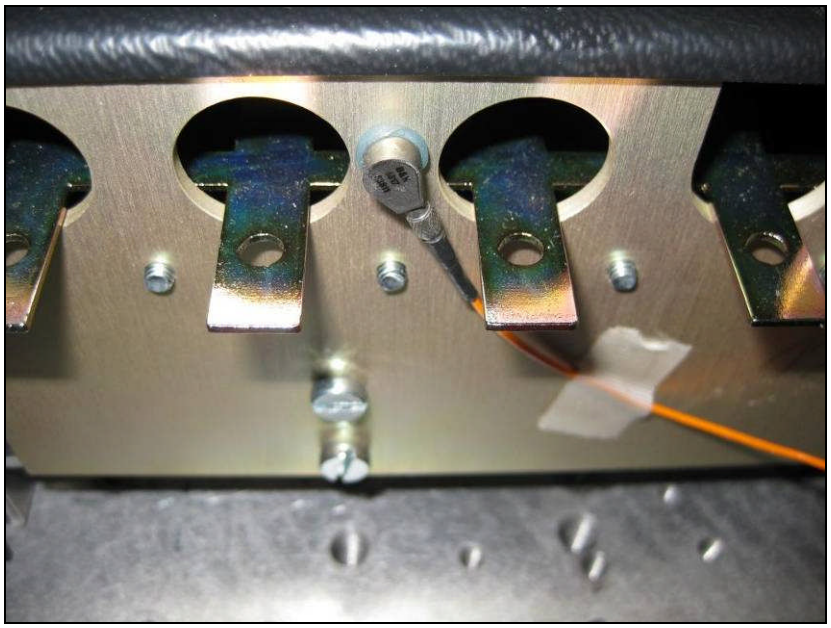
Picture 7: Position of resonance accelerometer (box middle and external) vibration z-axis



Picture 8: Position of resonance accelerometer (box single bar) vibration z-axis

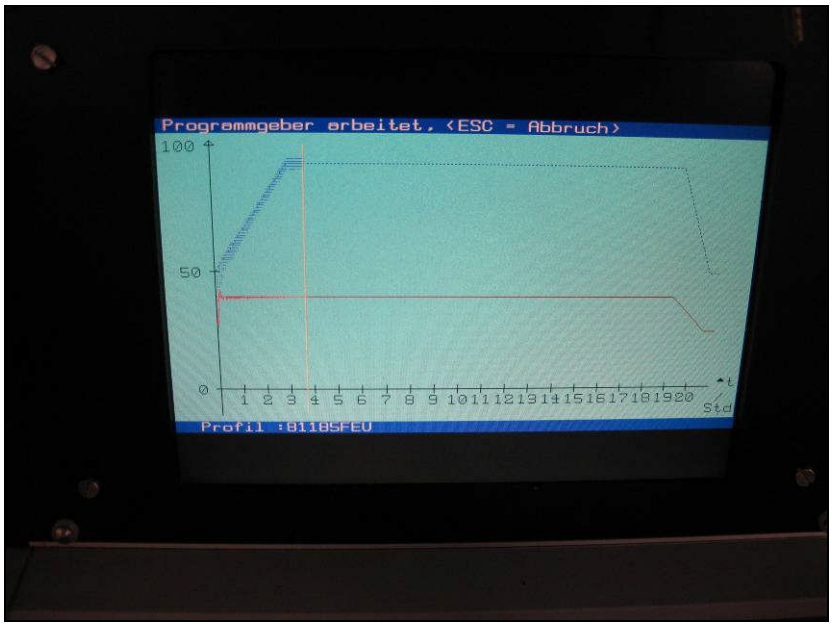


Picture 9: Position of resonance accelerometer (box external) vibration z-axis

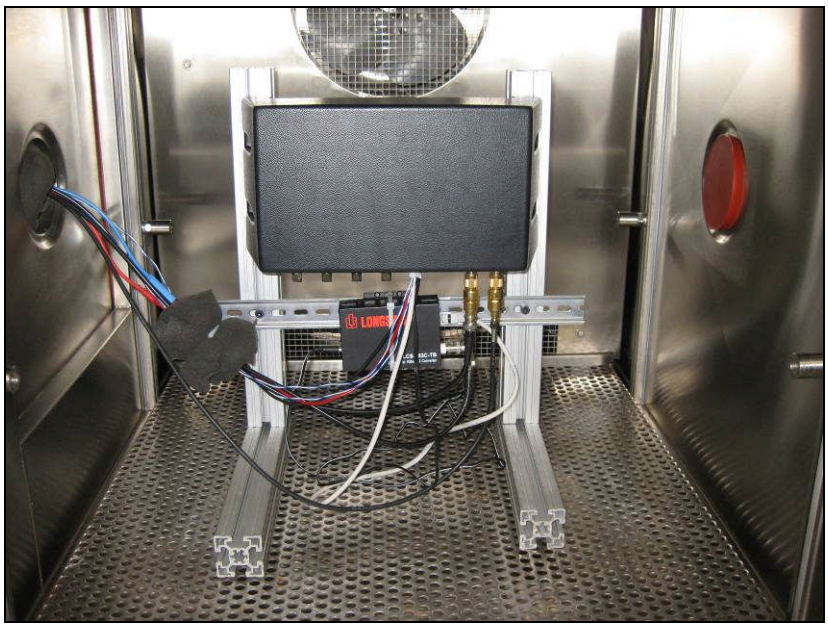


Picture 10: Test set-up dry heat (dry heat storage)

Picture 11: Profile damp heat

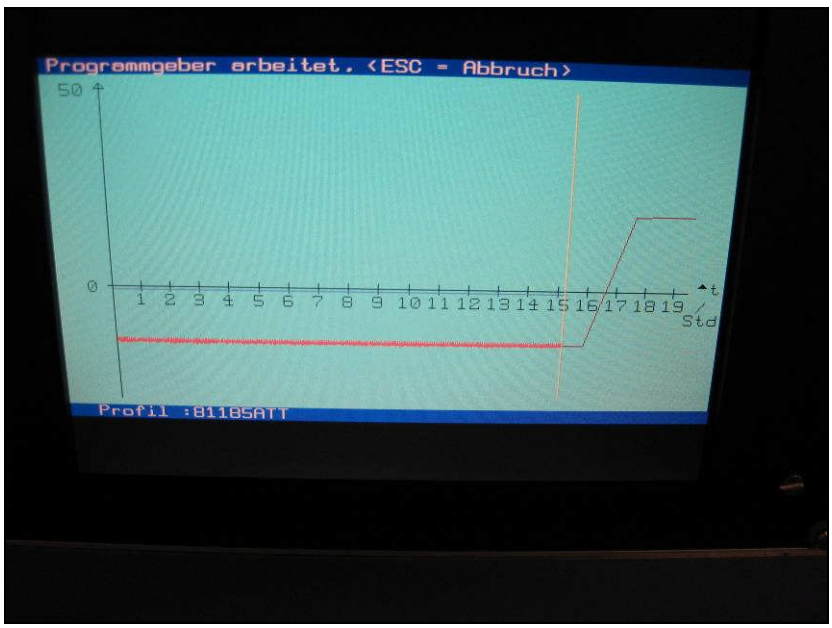


Picture 12: Test set-up damp heat



Picture 13: Test set-up cold

Picture 14: Profile cold

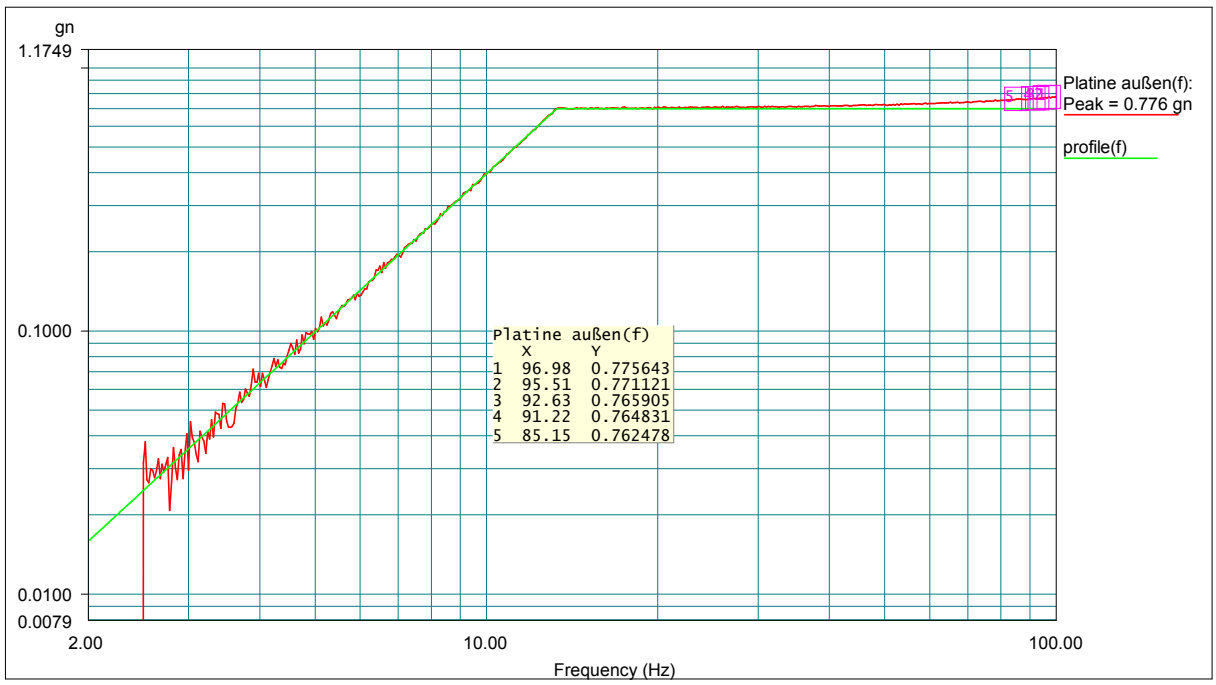


5 Diagrams

Diagram 1: Resonance search (board external) x-axis

Durchlauf 1.1

Project File Name: Vibro 2-100Hz.prj
Profile Name: Low Level Test Type: Swept Sine Run Folder: .\RunDefault Sep 04,2008 13-50-55



Level: 100 % Control Peak: 0.699811 gn Full Level Time: 00:10:40 Sweep Type: Logarithmic
Frequency: 99.976341 Hz Demand Peak: 0.700000 gn Time Remaining: 00:00:00 Sweep Rate: 0.5 Oct/Min
Data saved at 02:01:43 PM, Thursday, September 04, 2008 Report created at 02:01:43 , Donnerstag, September 4, 2008

Diagram 2: Resonance search (board middle) x-axis

Durchlauf 1.1

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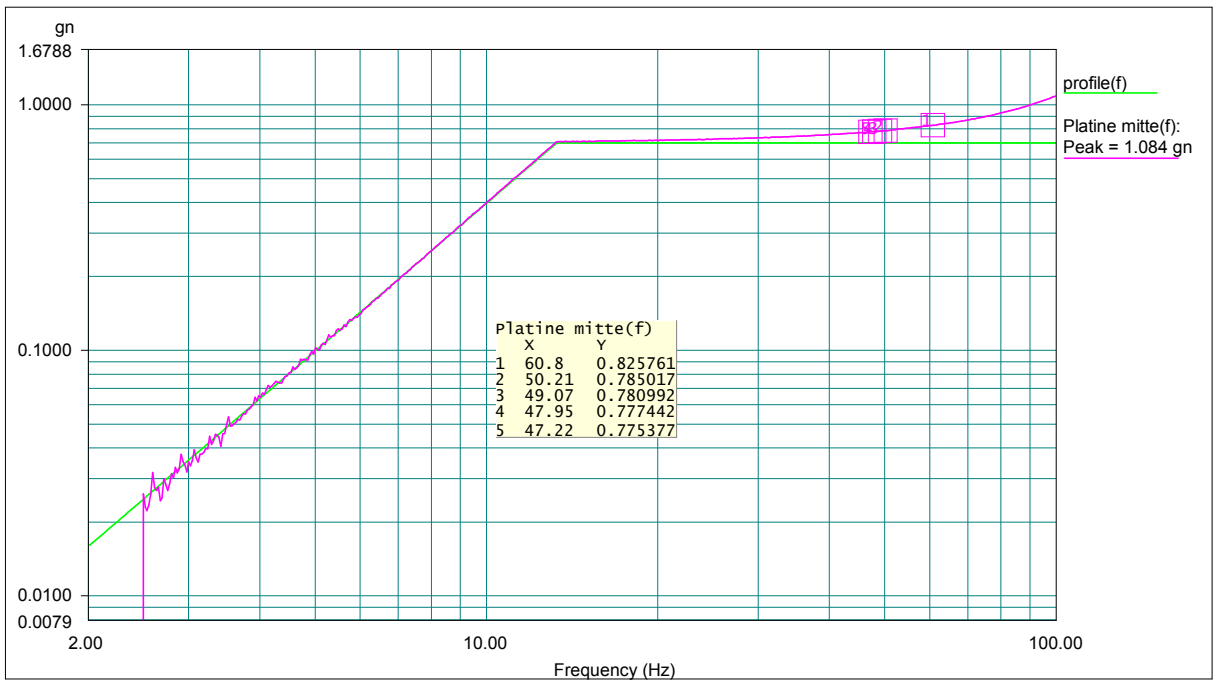

Level: 100 % Control Peak: 0.699811 gn Full Level Time: 00:10:40 Sweep Type: Logarithmic
Frequency: 99.976341 Hz Demand Peak: 0.700000 gn Time Remaining: 00:00:00 Sweep Rate: 0.5 Oct/Min
Data saved at 02:01:43 PM, Thursday, September 04, 2008 Report created at 02:01:43 , Donnerstag, September 4, 2008

Diagram 3: Dwell 100 Hz, x-axis

dwell Durchlauf 1.1

Project File Name: dwell 100Hz.prj
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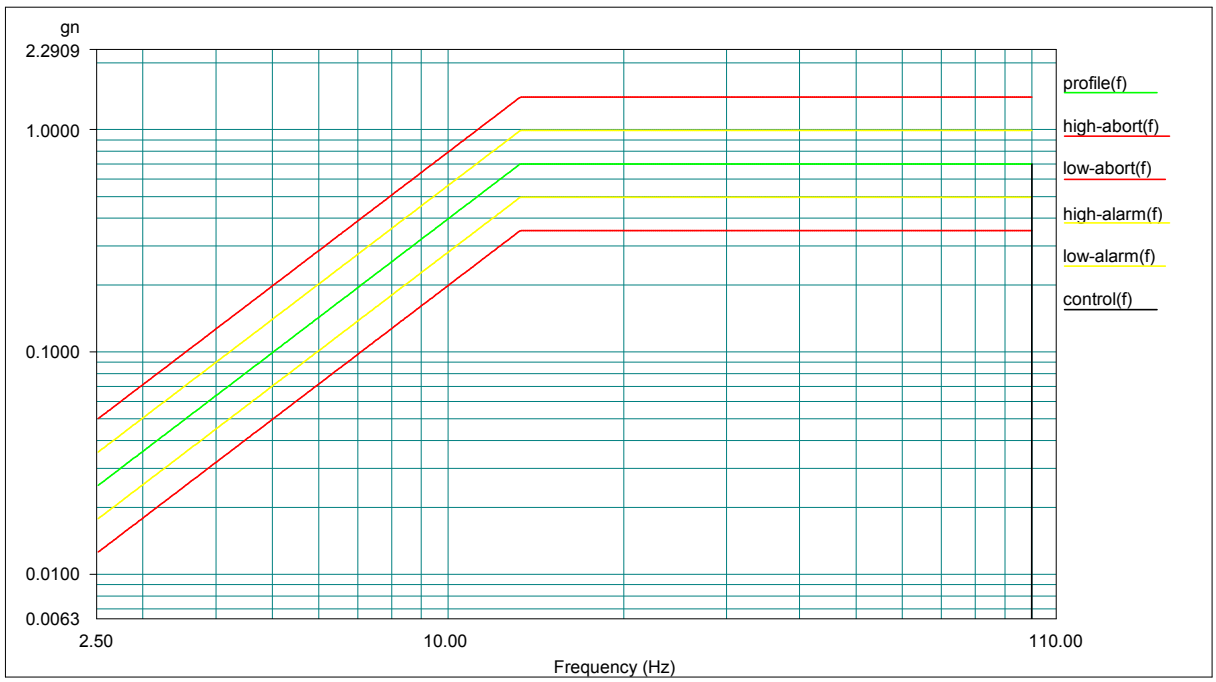

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Diagram 4: Resonance search (box above) y-axis

Durchlauf 2

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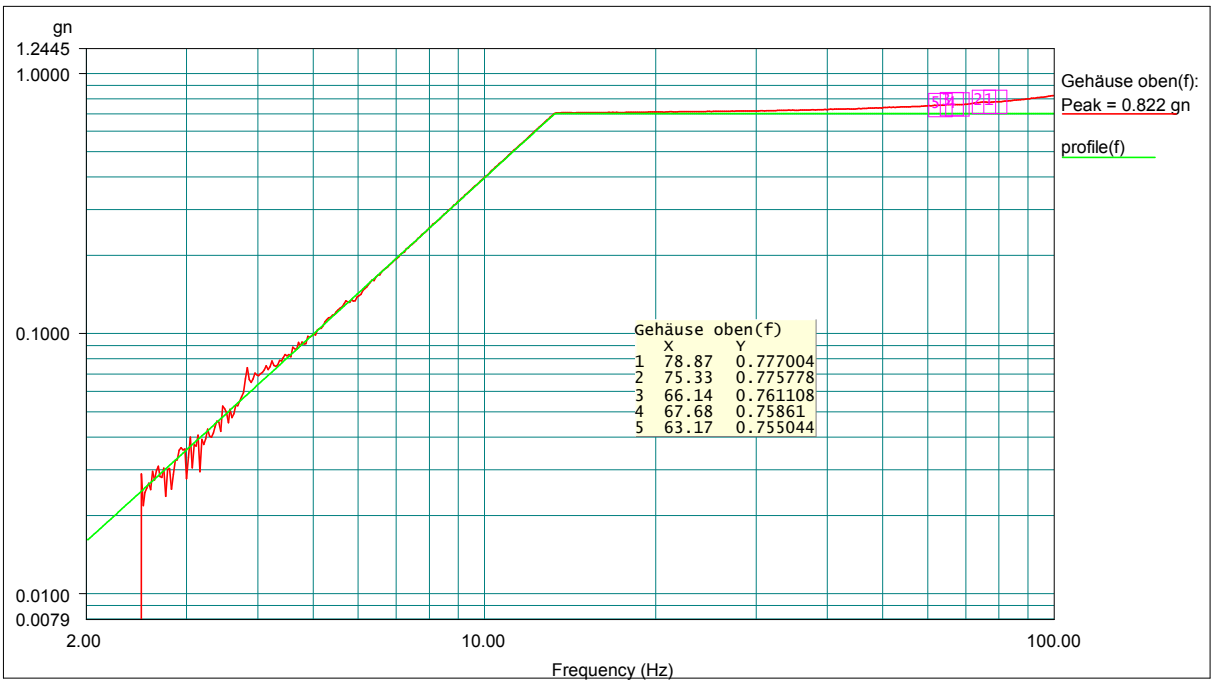

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Frequency: 99.933342 Hz Demand Peak: 0.700000 gn Time Remaining: 00:00:00 Sweep Rate: 0.5 Oct/Min
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Diagram 5: Resonance search (box below) y-axis

Durchlauf 2

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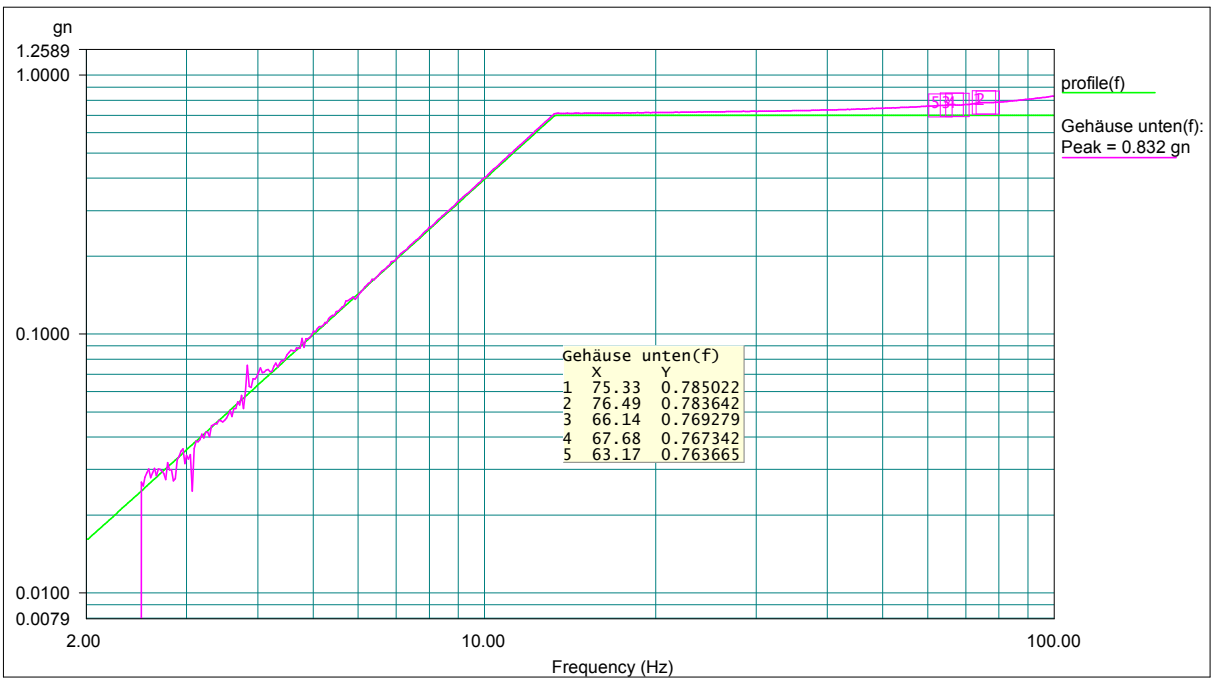

Level: 100 % Control Peak: 0.699644 gn Full Level Time: 00:10:40 Sweep Type: Logarithmic
Frequency: 99.933342 Hz Demand Peak: 0.700000 gn Time Remaining: 00:00:00 Sweep Rate: 0.5 Oct/Min
Data saved at 10:53:54 AM, Thursday, September 04, 2008 Report created at 10:53:55 , Donnerstag, September 4, 2008

Diagram 6: Dwell 100 Hz, y-axis

dwell Durchlauf 2

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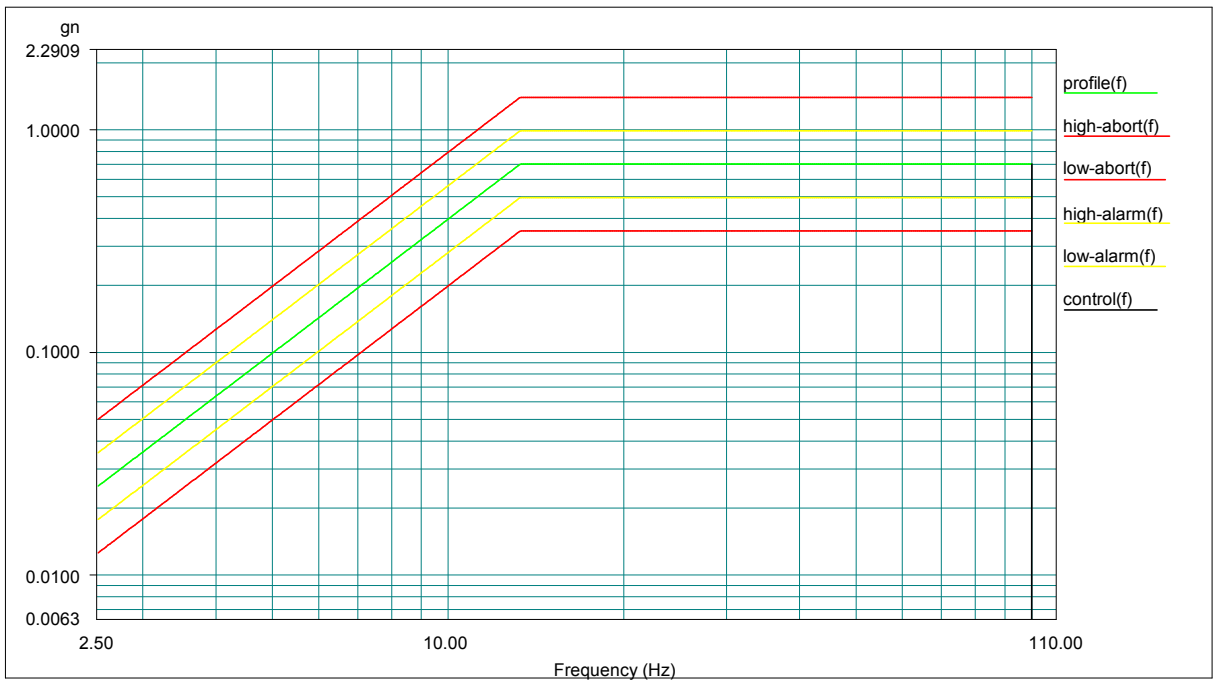

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Diagram 7: Resonance search (box middle) z-axis

Durchlauf 3

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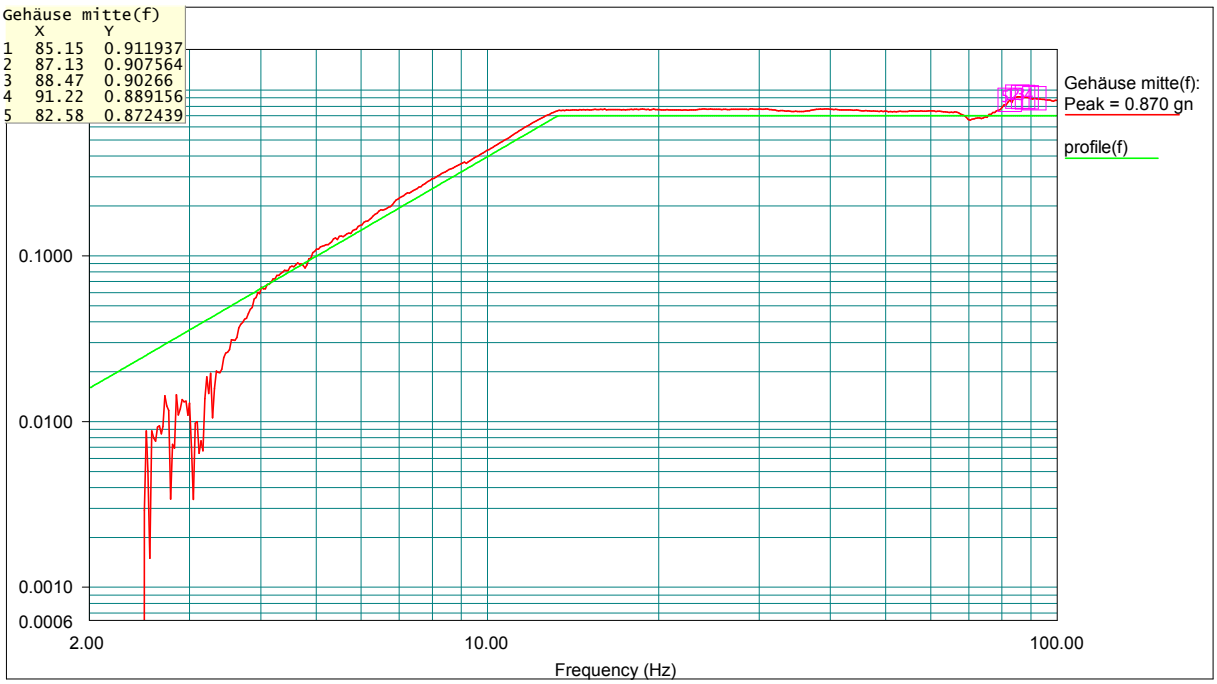

Level: 100 % Control Peak: 0.699945 gn Full Level Time: 00:10:40 Sweep Type: Logarithmic
Frequency: 99.982491 Hz Demand Peak: 0.700000 gn Time Remaining: 00:00:00 Sweep Rate: 0.5 Oct/Min
Data saved at 08:54:34 AM, Friday, September 05, 2008 Report created at 08:54:35 , Freitag, September 5, 2008

Diagram 8: Resonance search (box external) z-axis

Durchlauf 3

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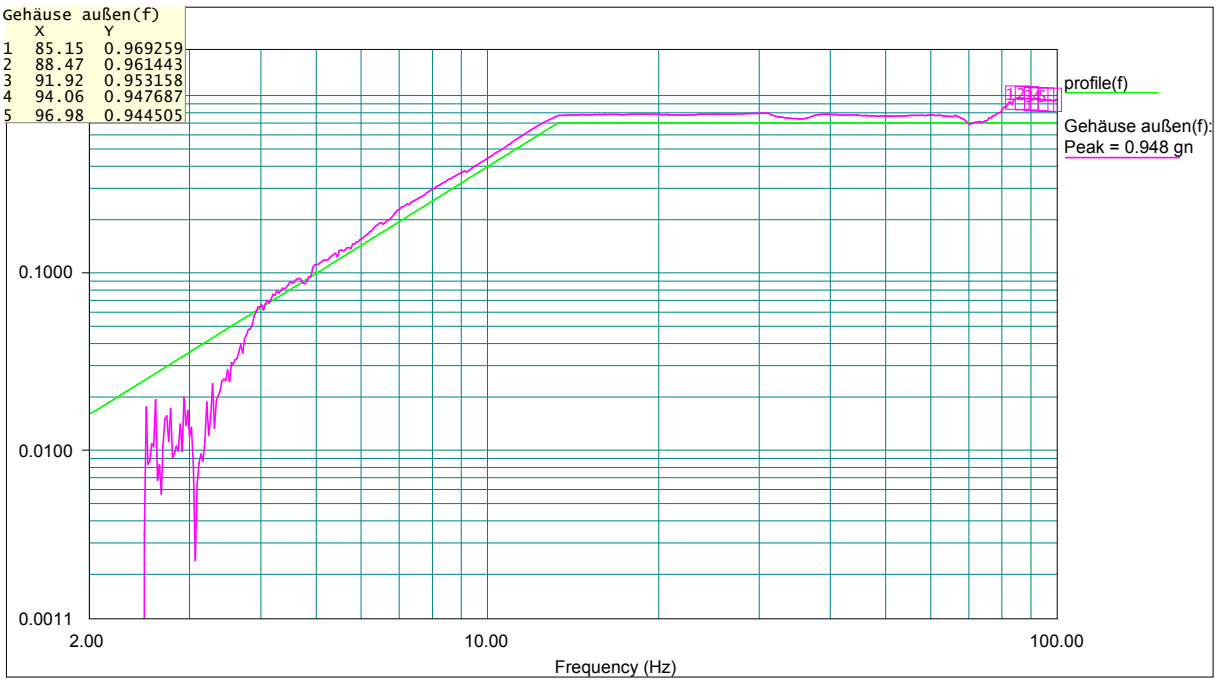

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Frequency: 99.982491 Hz Demand Peak: 0.700000 gn Time Remaining: 00:00:00 Sweep Rate: 0.5 Oct/Min
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Diagram 9: Resonance search (box single bar) z-axis

Durchlauf 3.1

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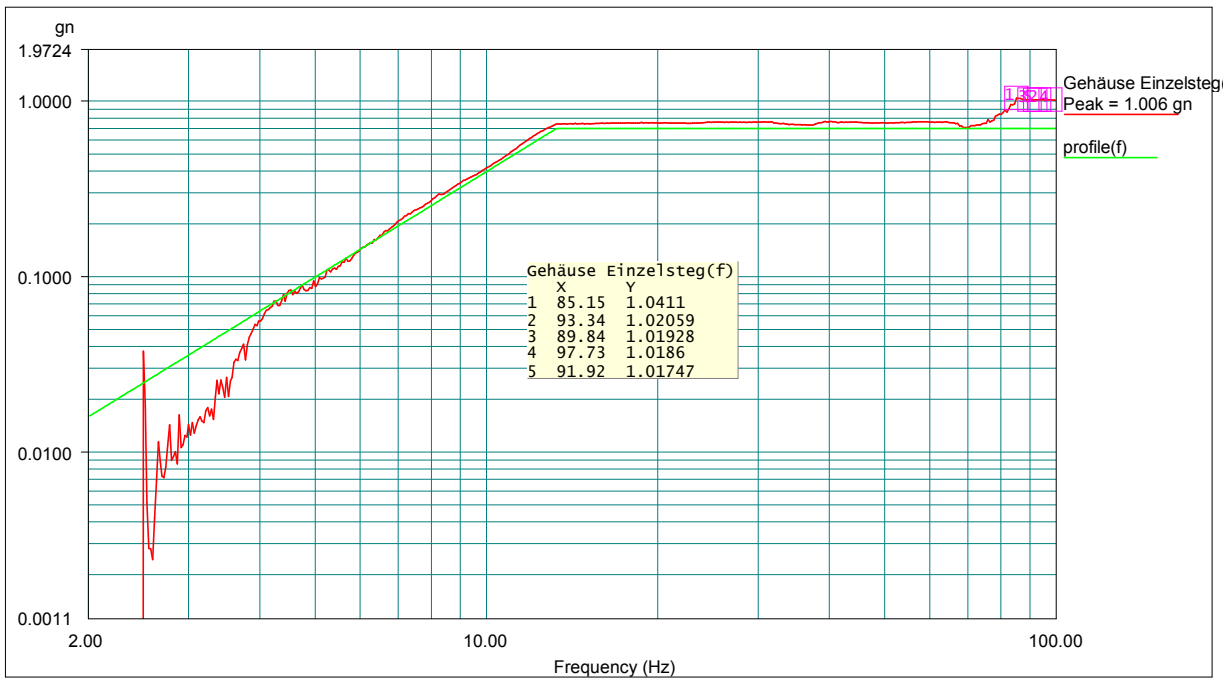
Profile Name: Low Level Test Type: Swept Sine Run Folder: .\RunDefault Sep 05,2008 10-10-47

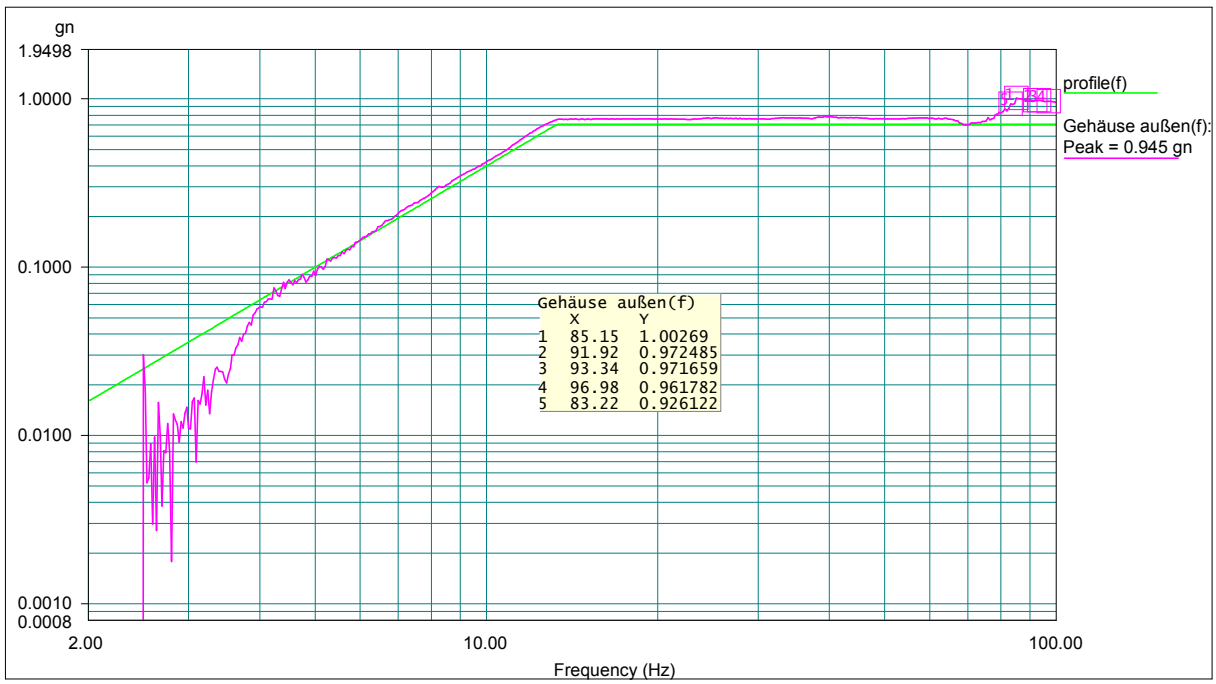


Level: 100 % Control Peak: 0.698250 gn Full Level Time: 00:10:40 Sweep Type: Logarithmic
Frequency: 99.951767 Hz Demand Peak: 0.700000 gn Time Remaining: 00:00:00 Sweep Rate: 0.5 Oct/Min
Data saved at 10:21:59 AM, Friday, September 05, 2008 Report created at 10:22:00 , Freitag, September 5, 2008

Diagram 10: Resonance search (box external) z-axis

Durchlauf 3.1

Project File Name: Vibro 2-100Hz.prj
Profile Name: Low Level Test Type: Swept Sine Run Folder: .\RunDefault Sep 05,2008 10-10-47

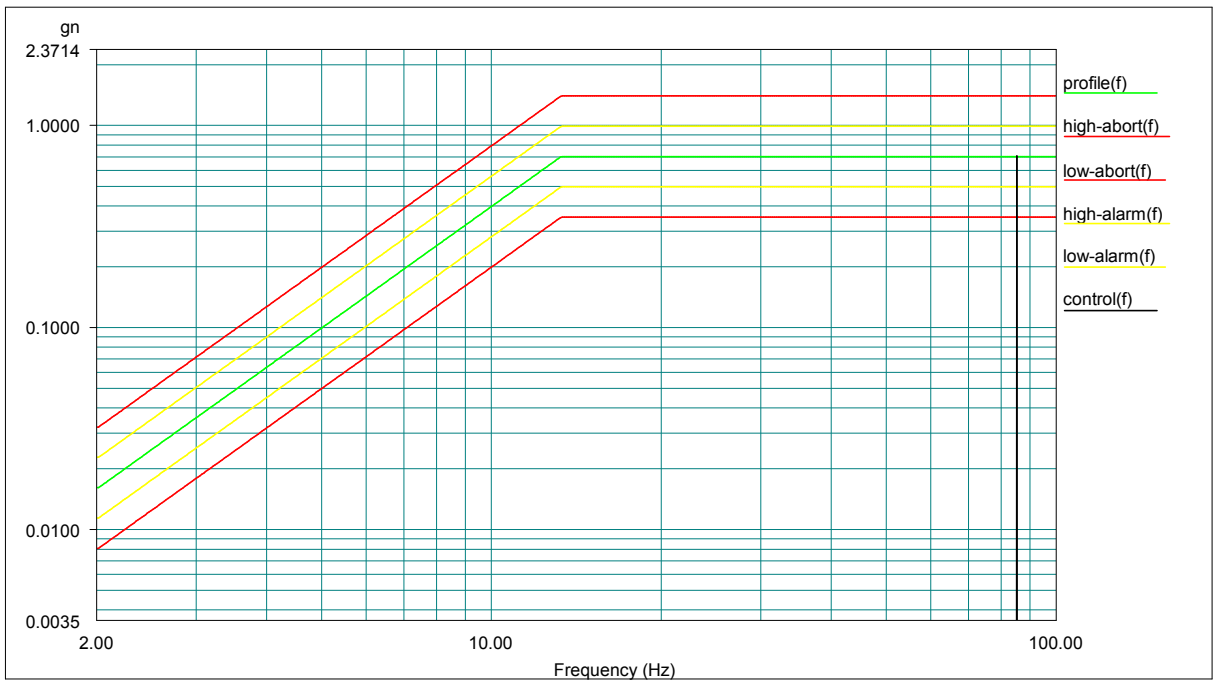


Level: 100 % Control Peak: 0.698250 gn Full Level Time: 00:10:40 Sweep Type: Logarithmic
Frequency: 99.951767 Hz Demand Peak: 0.700000 gn Time Remaining: 00:00:00 Sweep Rate: 0.5 Oct/Min
Data saved at 10:21:59 AM, Friday, September 05, 2008 Report created at 10:22:00 , Freitag, September 5, 2008

Diagram 11: Dwell 85.15 Hz, z-axis

dwell Durchlauf 3

Project File Name: dwell 85.15Hz.prj
Profile Name: Low Level Test Type: Swept Sine Run Folder: .\RunDefault Sep 05,2008 10-27-59



Level: 100 % Control Peak: 0.703546 gn Full Level Time: 02:00:00 Sweep Type: Logarithmic
Frequency: 85.150002 Hz Demand Peak: 0.700000 gn Time Remaining: 00:00:00 Sweep Rate: 1 Oct/Min
Data saved at 12:28:04 PM, Friday, September 05, 2008 Report created at 12:28:04 , Freitag, September 5, 2008

6 Schedules

6.1 List of pictures

6.2 List of figures

6.3 List of diagrams