Rapport
Report

NORWEGIAN ACCREDITATION
TEST P006

Teknologisk institutt

Oppdragsgiver *Client*	**Utførende enhet/lab.** *Department/laboratory responsible*
Bård Eker Industrial Design AS Torsnesveien 210 B 1634 GAMLE FREDRIKSTAD Norway	The National Institute of Technology, Laboratory Services Materials Technology, Environmental Test Laboratory Po.Box 174 NO - 3601 KONGSBERG

Rapportnr. *Report no.*

310-03-0309

Tittel *Title*

Environmental Test Report
Vibration and Shock
Projector F1 XGA
Bård Eker Industrial Design as

Dato *Date*	**Utarbeidet av** *Prepared by*	**Godkjent av** *Approved by*	**Innleveringsdato for prøve** *Date of receipt of test object*
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	[X] Ja *Yes* [ ] Nei *No*	Ronny Bjørnsen	

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Contents

1. Scope

The environmental Test Laboratory at Teknologisk institutt Laboratorietjenester as, has performed Vibration test on 4 different projectors F1 XGA P/N 101-0001-00, S/N; test unit 1: s/n 03060016, test unit 2: s/n C-4305, test unit 3: s/n 02480010, test unit 4: no number, for Bård Eker Industrial design as. The aim of this test was retest in vertical axis with different types of damping mounted in the projector main board and connector card, to detect and state amplifications at critical frequencies.
The test was performed 25/11-2003.
The test was executed under accreditation granted by Norwegian Accreditation, accreditation no. P006, and was based on the general test requirements specified in IEC 60068 –1, IEC 60068-2-6 and IEC 60068-2-27.

The following personnel were participating in the test:
Ronny Bjørnsen, Bård Eker Industrial Design as.
Stig Lundberg, Bård Eker Industrial Design as.
Tore Wilhelmsen, Bård Eker Industrial Design as.
John Ane Johansen, Teknologisk institutt Laboratorietjenester as.
Erik Haugejorden, Teknologisk institutt Laboratorietjenester as.

2. Reference Documents

1 Projection Design Environmental testing rev. 1.
2 KS-Handbook, Quality Manual for Teknologisk institutt Laboratorietjenester as.
3 IEC 60068-1, General requirements sixth edition including amendment 1.
4 IEC 60068-2-6, Test Fc and guidance – Vibration (sinusoidal).
5 IEC 60068-2-27, Test Ea and guidance, Shock

3. Test Procedure

The environmental test records are given in appendix 2. The Projectors was mounted on the vibrator in the different axis as shown in fig.: 1. Control and Unit response accelerometers were mounted as shown in figure 1, see test equipment list in appendix 1. Resonance search, end endurance test was performed on the vibrator. Shock was performed on the shock machine 54 g 17 milli seconds in vertical axis positive direction.
The Projectors was checked for function during and after the different tests.
The test requirements were in accordance with referenced documents 1-2.

Measuring points:

MP1:	Control	Fixture
MP2:	Unit Response	Main Board
MP3:	Unit Response	Connector board

3.1 Resonance sweep - sinusoidal vibration

The following test parameters were used:

Frequency range:	10-1000Hz.
Excitation level:	1g.
Sweep rate:	1,0 oct / min.
Duration:	one sweep from 10-1000 Hz

3.2. Endurance test

The following test parameters were used:

Endurance test on recorded resonances in the frequenzy range 10-1000 Hz.
Exitation level: 3g. See table 1 for recorded resonances.

3.3 Shock tests

The following parameters were used:

Excitation:	54 g halfsine
Duration:	17 msec.
Number of Shocks:	4 in positive direction.
No. of axis:	Vertical axis (z)

4. Results

There was performed functional test before, during and after vibration test. Shock test was performed on test units 1 and 2 only. All test unit's peformed OK after test. There were no signs of structural damage. Test results to be seen in appendix 2.

Table 1: Following frequencies was detected on each test unit:

Critical freq.	Apmlification	Freq. After test	Amplification	Comment
802 Hz	15,26	797 Hz	11,8	Full test
661 Hz	3,85	--	--	Part test at customer choice
661 Hz	--	--	--	As unit no. 2, but different damping
549 Hz	5,37	--	--	Part test at customer choice

Customer choise to perform endurance test on unit 3 on same frequency as unit no. 2.

5. Conclusion

Projector F1 XGA did not give any signs of failure or damage during or after vibration and shock test.

Figure 1
Projector mounted on the vibrator.

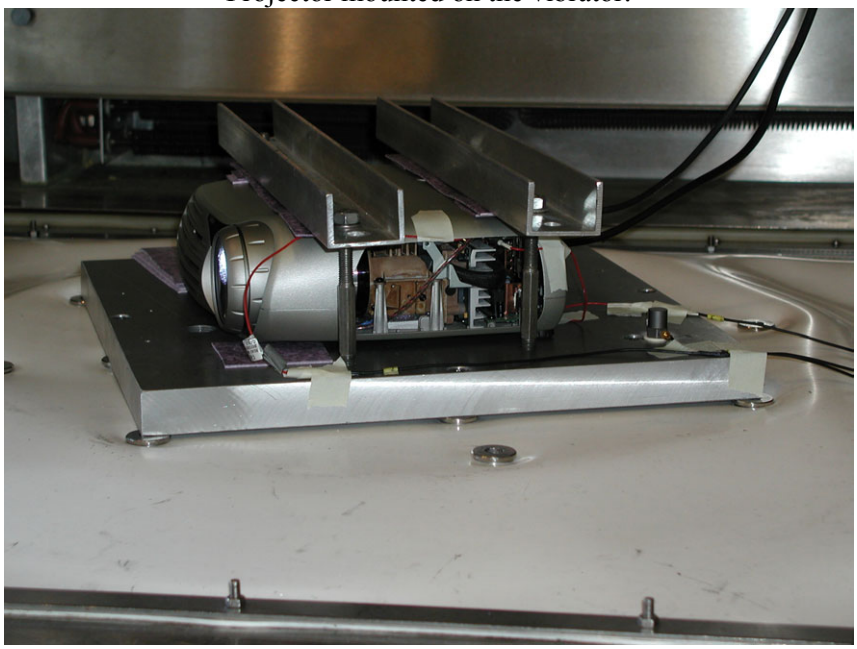
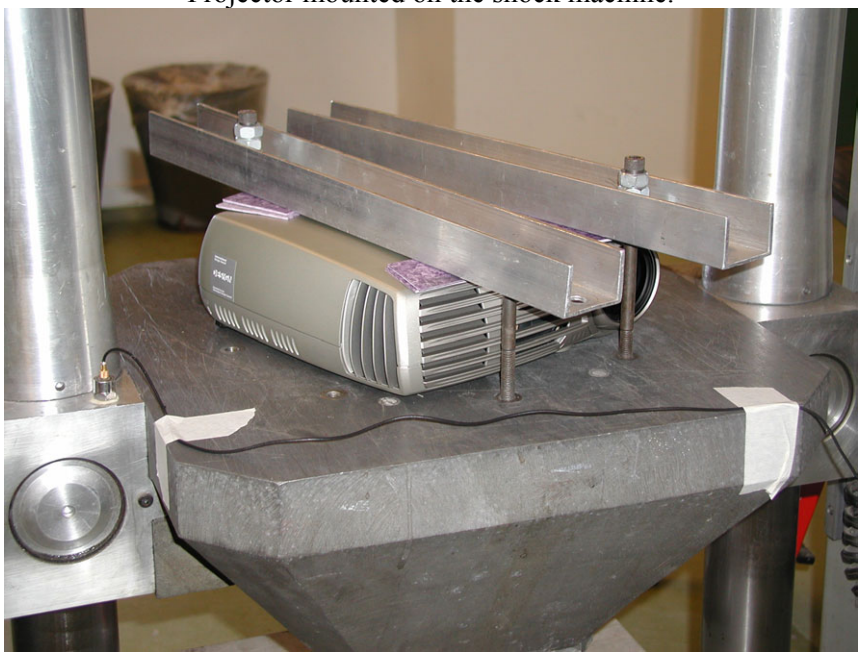


Fig. 2.
Projector mounted on the shock machine.



Appendix 1.

Test Equipment

Test Equipment:

Int.no.3848	Vibrator	LDS –V810-440 B		Cal.: N.A.
	Amplifier	LDS DPAX 20		Cal.: N.A.
Int.no.16137	Vibration control sys	DP350WIN	Cal.: 27.08.03	Interval: 6 months
Int.no.1985	Charge amplifier	Brüel&Kjær	Cal.: 27.06.03	Interval: 12 months
Int.no.1975	Charge amplifier	Brüel&Kjær	Cal.: 01.07.03	Interval: 12 months
Int.no.1283	Charge amplifier	Brüel&Kjær	Cal.: 27.06.03	Interval: 12 months

Accelerometer

Int.no.173696	Accelerometer	B730	Cal.: 28.10.03	Interval: 12 months
Int.no.23598	Accelerometer	810	Cal.: 21.03.03	Interval: 12 months
Int.no.23599	Accelerometer	914	Cal.: 25.02.03	Interval: 12 months

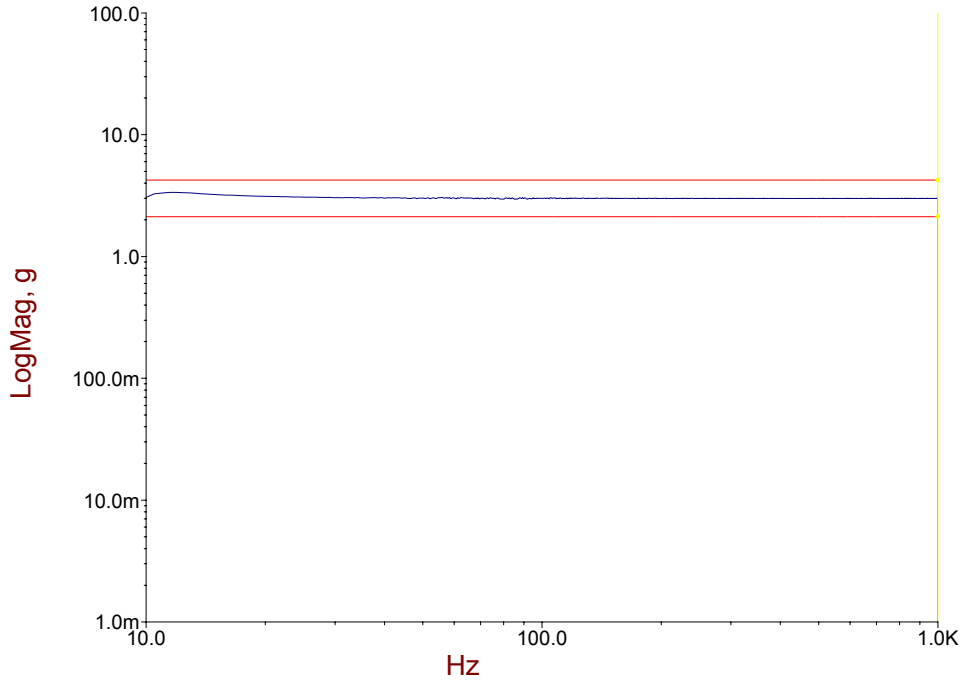
Shock:

Int.no: 2832	shock MRL IMPAC 1818		Cal. N/A	
Int.no. 16035	FFT analysator	DP104 s/n 6069	Cal. 11/9-03	Interval: 6 months
Int.no. 1975	Charge amplifier	Bruel&/Kjær	Cal.: 01.07.03	Interval: 12 months
Int.no.173699	Accelerometer	B737	Cal.: 16.12.02	Interval: 12 months

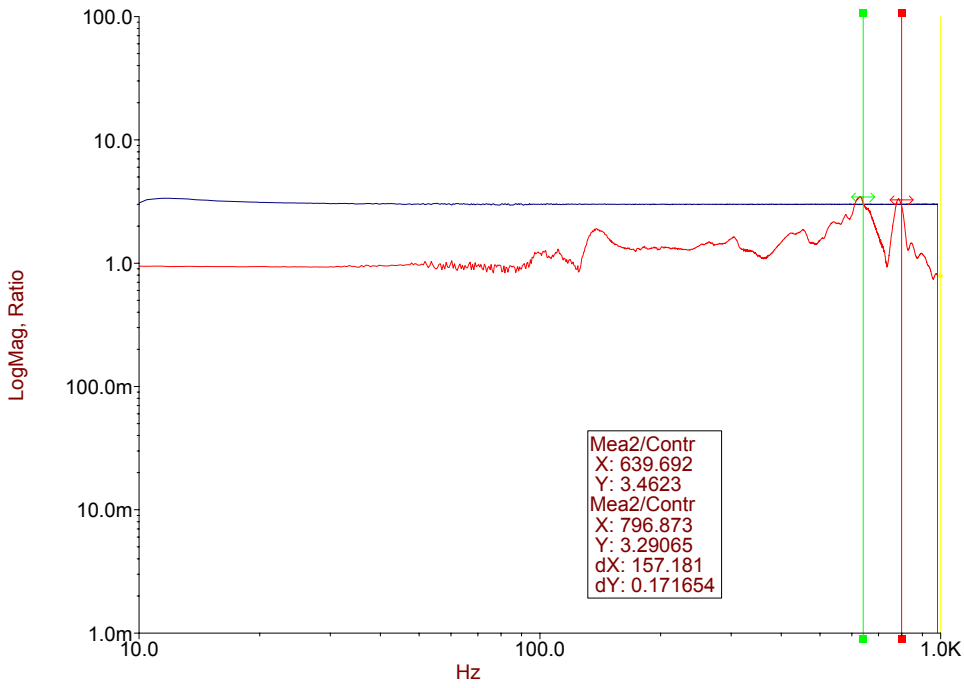
Appendix 2.

Test records.

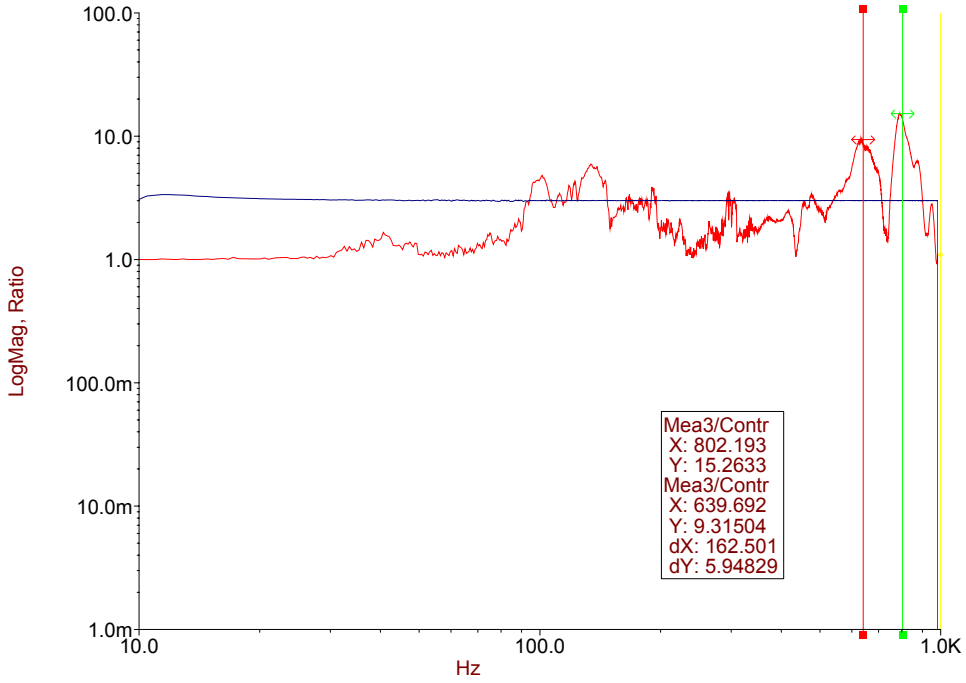
Test unit P/N 101-0001-0001 S/N 03060016
Resonance sweep 10-1000 Hz
Control



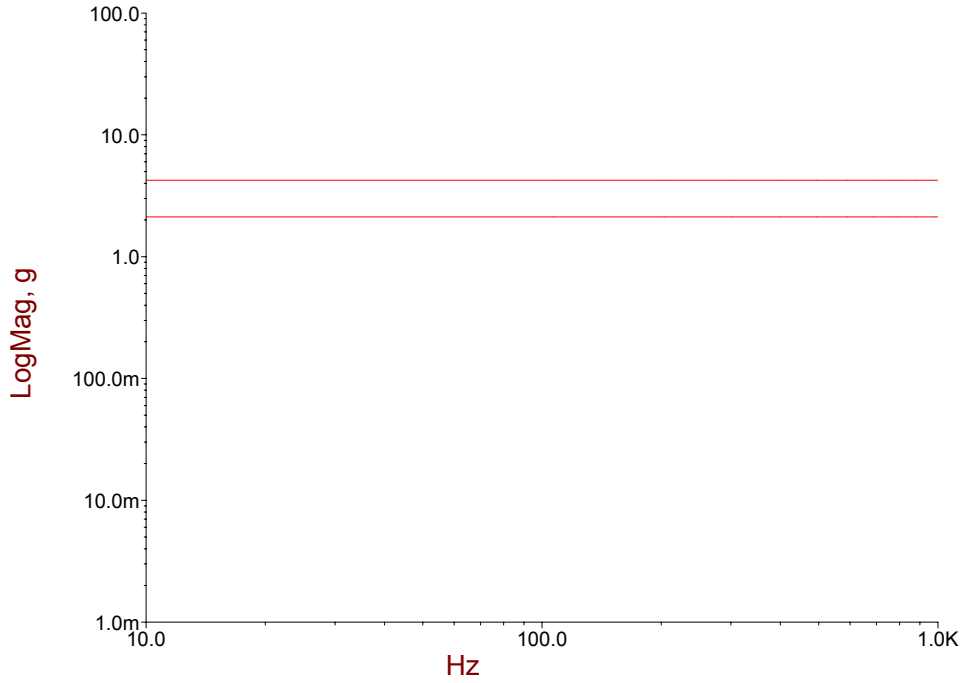
Main board



Connector board

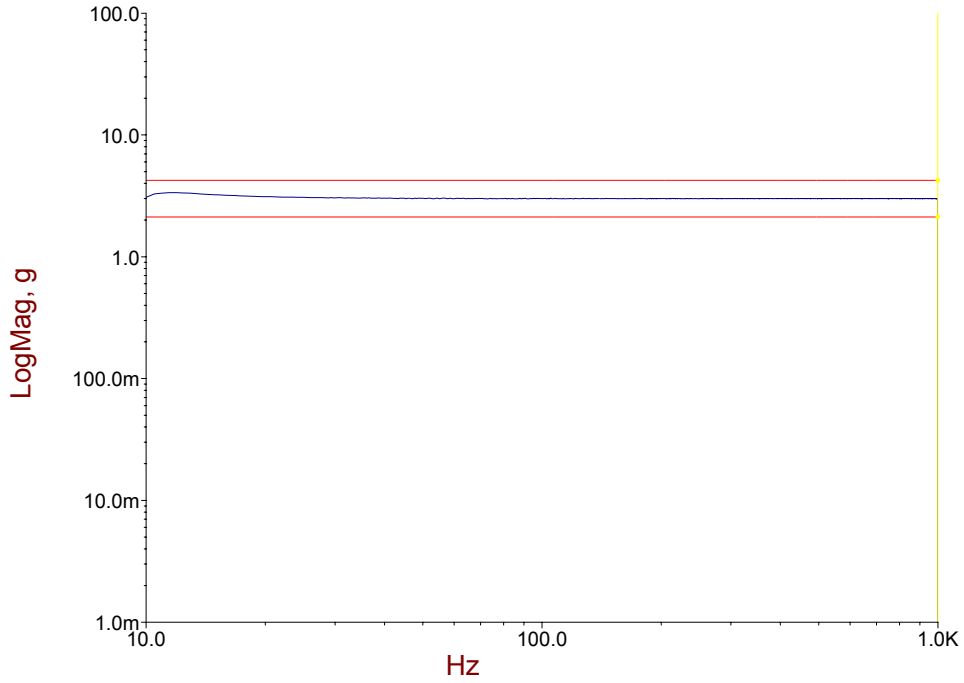


Endurance test 802 Hz 30 min.

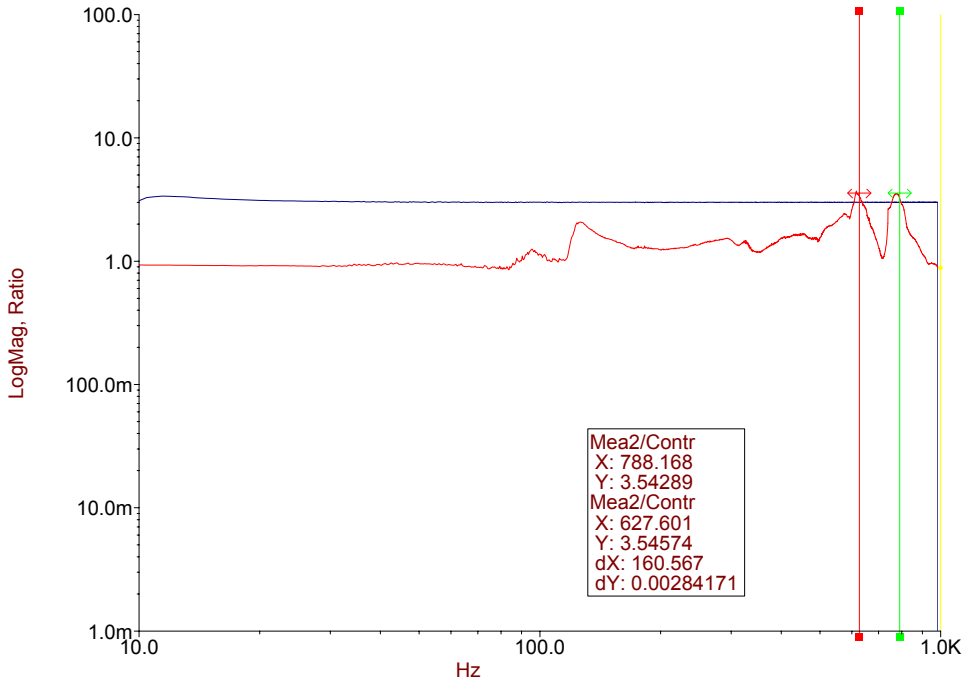


Resonance sweep after endurance test.

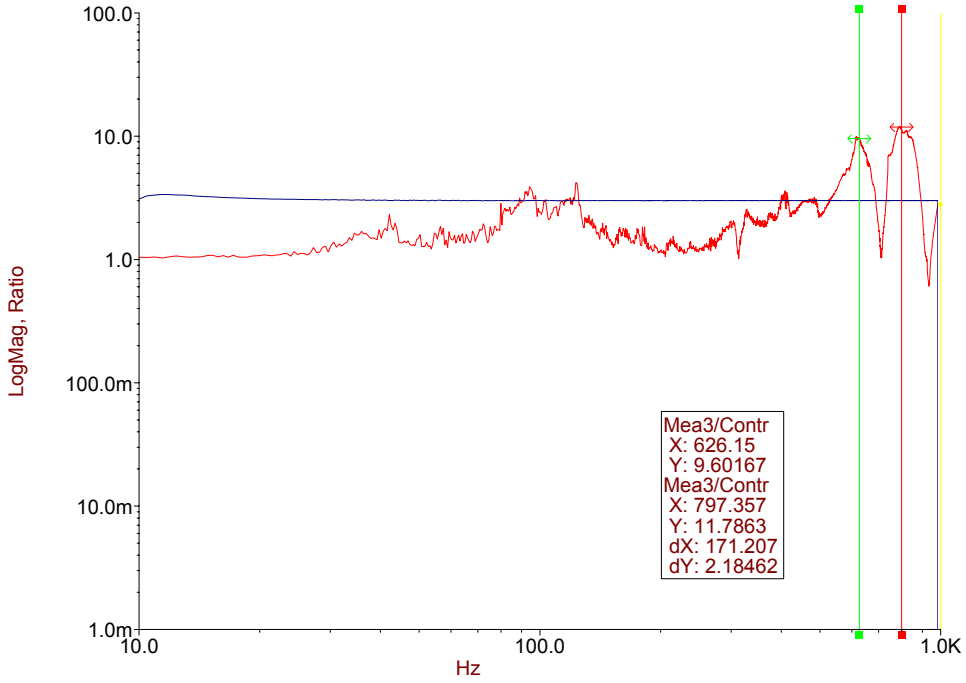
Control



MP2 main board



MP3 connector board



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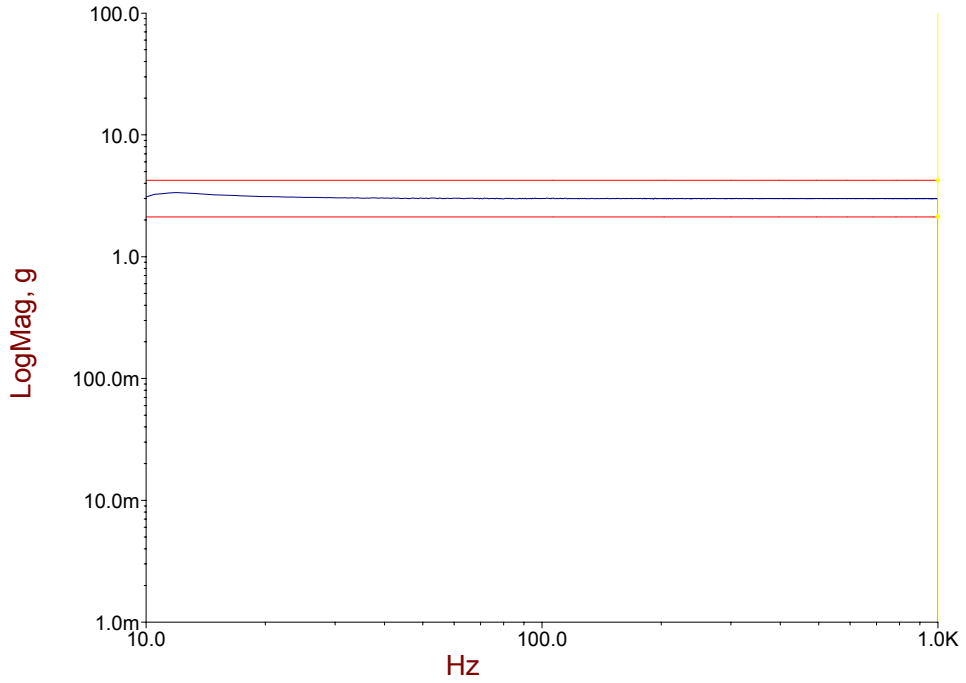
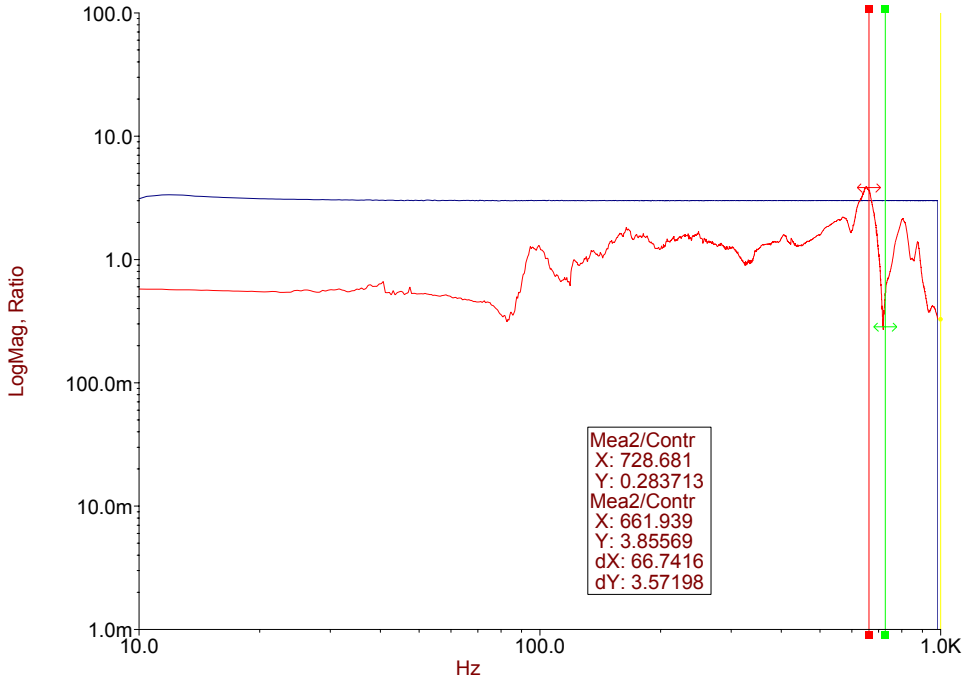
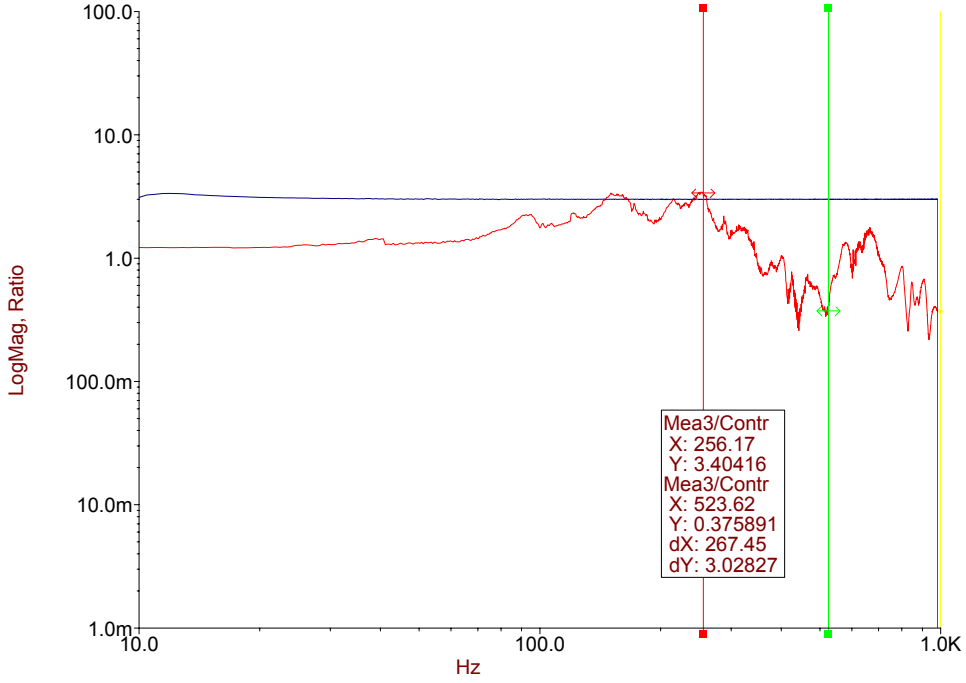
Test unit P/N 101-0001-0001 S/N C-4305
Resonance sweep 10-1000 Hz
control



Main board

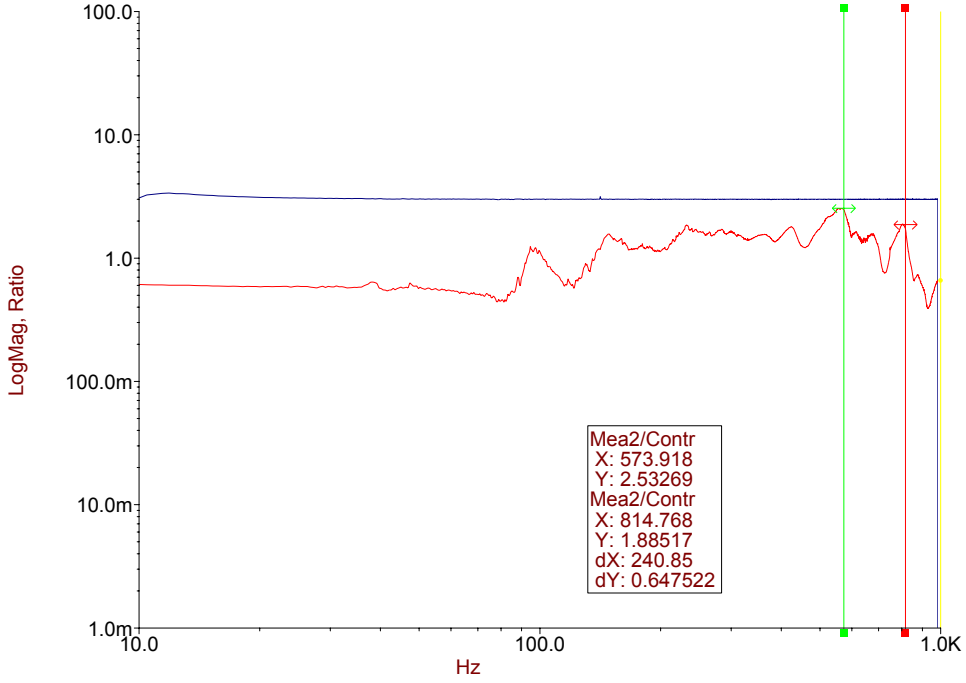


Connector board

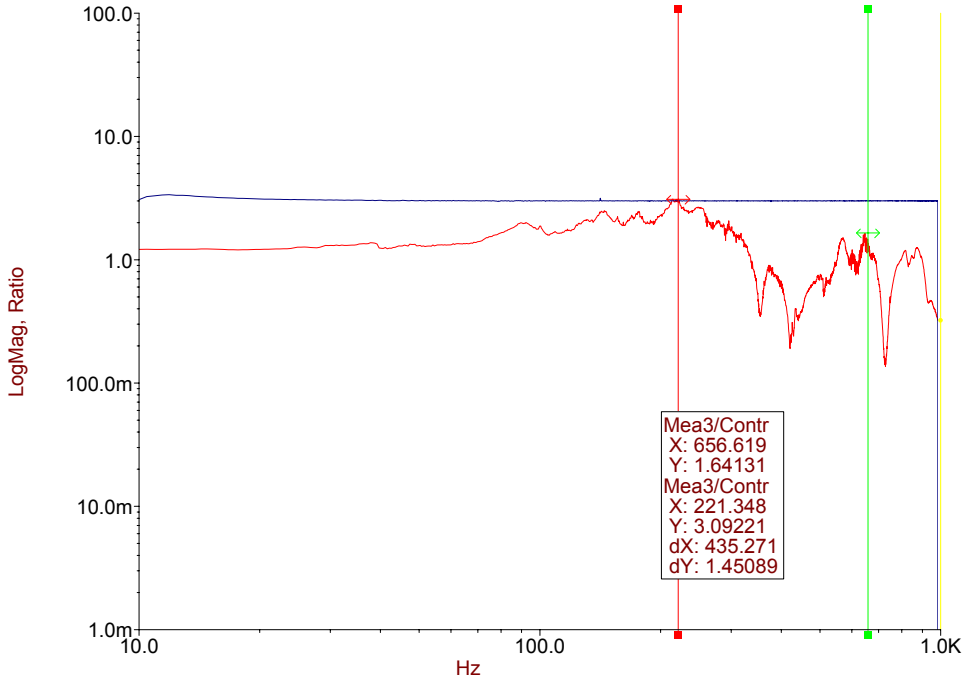


Mounted Aluminium supports under aft corners on test unit for support.
Test unit P/N 101-0001-0001 S/N C-4305
Resonance sweep 10-1000 Hz

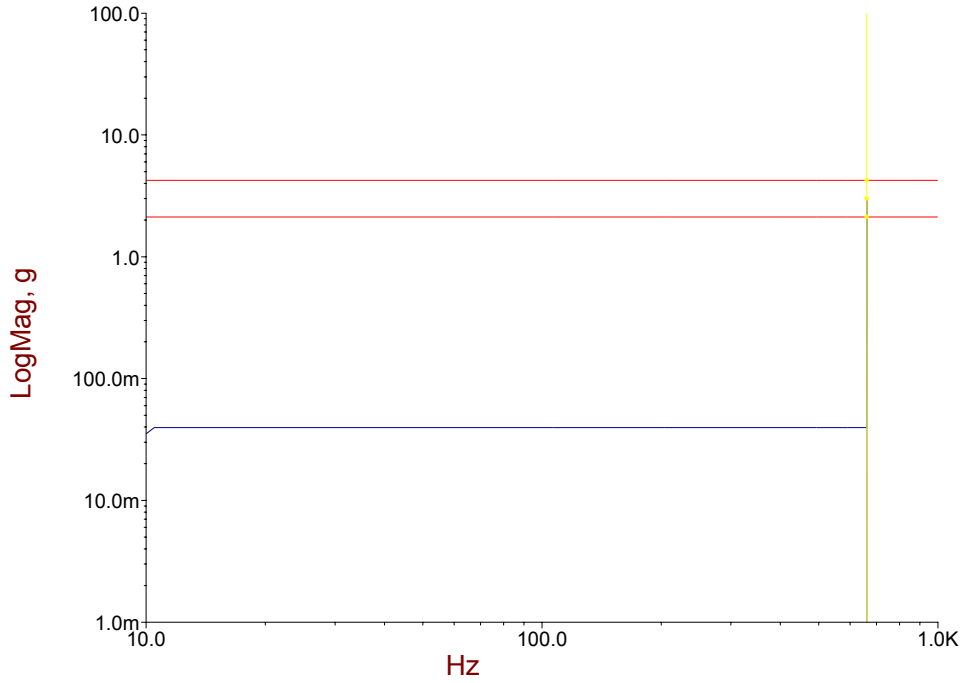
Main board



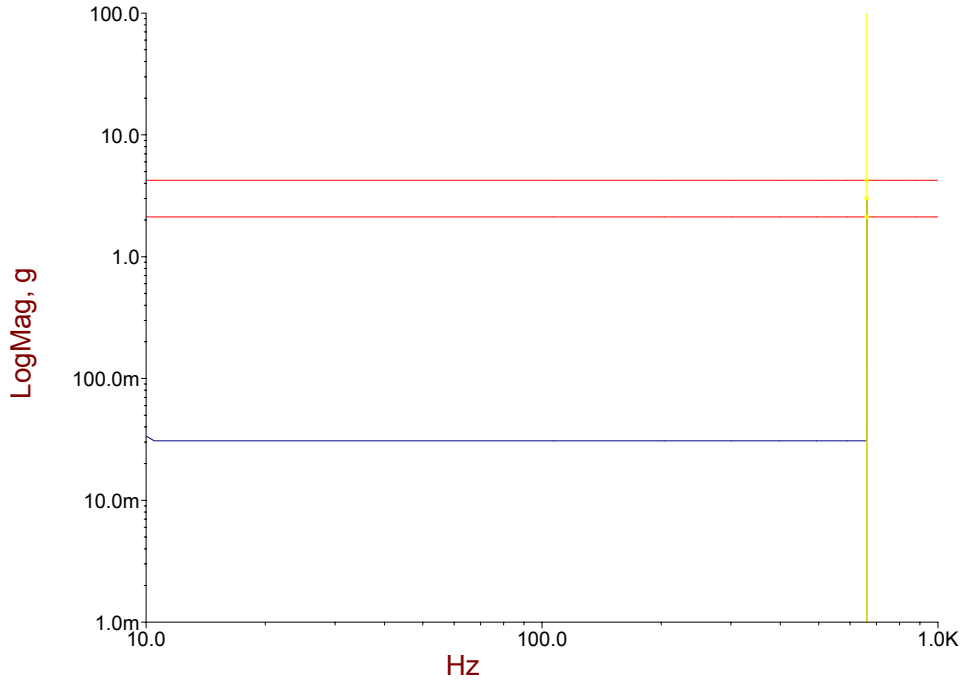
Connector board



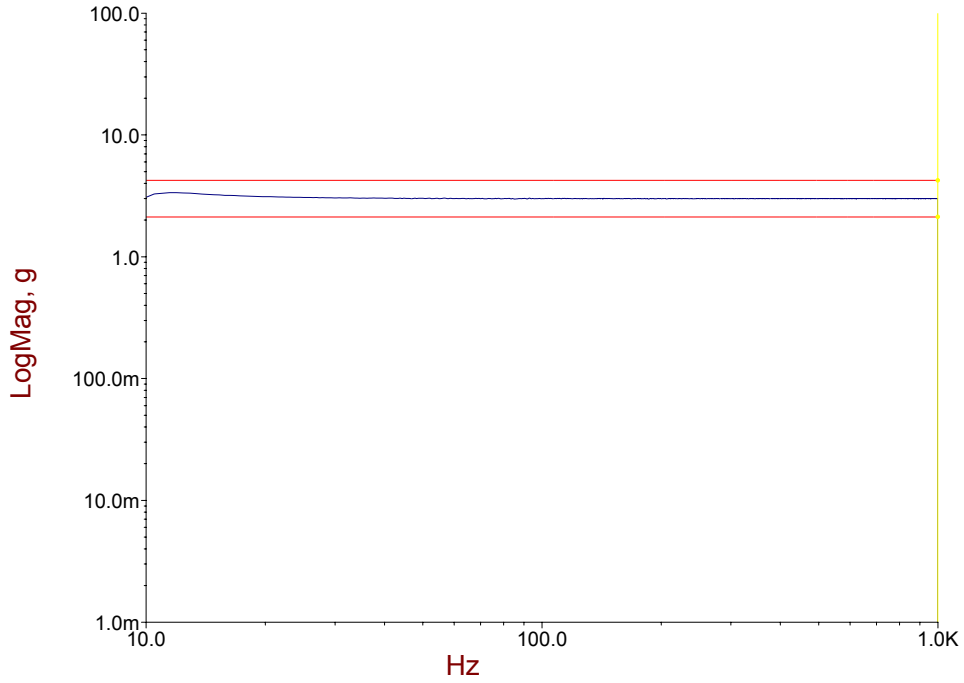
Test unit P/N 101-0001-0001 S/N C-4305
Endurance test,661 Hz 30 minutes
Control.



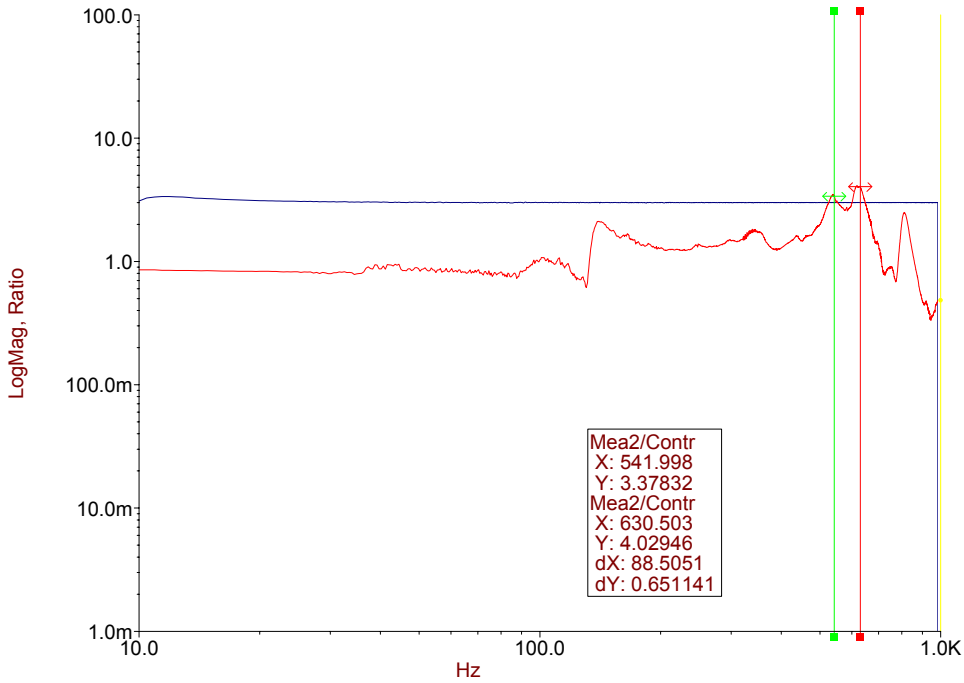
Test unit no. 3, Test unit P/N 101-0001-0001 S/N 03060016
Endurance test; 661 hz 30 minutes. Same unit as no 3 but with different damping foam.
Control



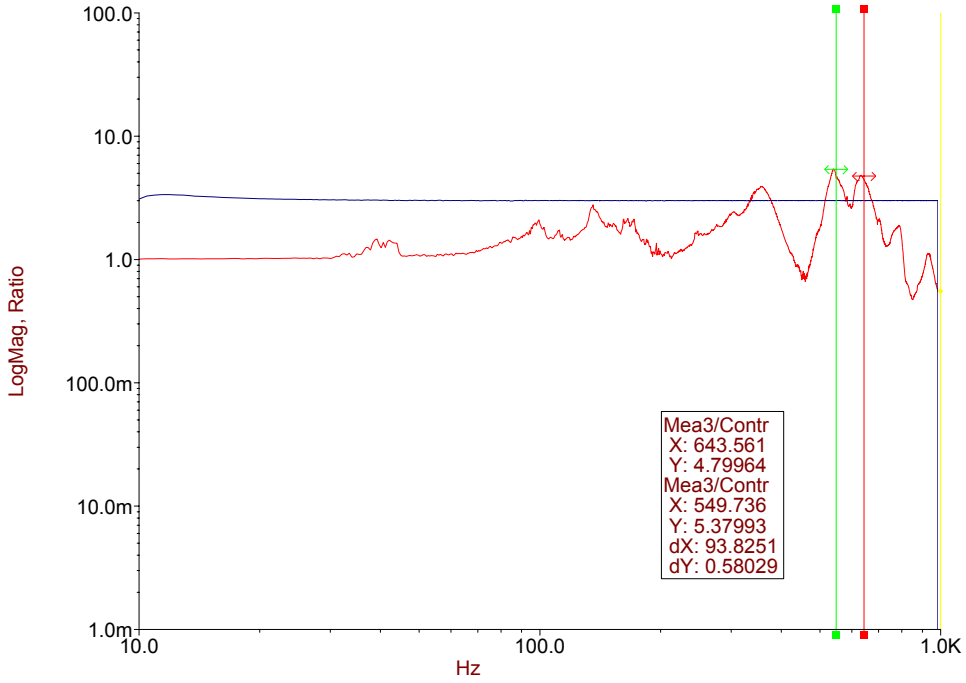
Test unit no. 4, no serial number available.
resonance sweep 10-1000 hz
control



Main board



Connector board



Test unit no 4,
Endurance test 549 Hz, 30 minutes
control