	SPIRE Project Document	Ref: SPI_BSM_REP_00009.doc Issue: 1.0 Date: 27-Feb-04 Author: DMcN Page 1 of 4
	BSM LAB TESTS LOG SHEET	

Document Title:	SPIRE LAB TESTS LOG SHEET
Document Number:	SPI_BSM_REP_00009.doc
Issue:	1.0
Date:	18-Mar-04

Document prepared by:		Signature and date	
Document approved by:		Signature and date	
Document released by:		Signature and date	

Distribution List :

SPIRE-Project	Doug Griffin	
	Eric Clark	
UK ATC	Colin Cunningham	
	Gillian Wright	
	Phil Parr Burman	
	Tom Baillie	
	Brian Stobie	
	Tom Paul	
	Ian Laidlaw	
	Gary Rae	
	Derek Ives	
	Ian Bryson	



	SPIRE Project Document	Ref: SPI_BSM_REP_00009.doc
	BSM LAB TESTS LOG SHEET	Issue: 1.0 Date: 27-Feb-04 Author: DMcN Page 3 of 4

Table of Contents

1. Test description:	4
2. Apparatus used:	4
3. Notes on Test:	4
4. Results:	4
5. Conclusion:	4

	SPIRE Project Document	Ref: SPI_BSM_REP_00009.doc
	BSM LAB TESTS LOG SHEET	Issue: 1.0 Date: 27-Feb-04 Author: DMcN Page 4 of 4

Date: Shake: 27 / 02 / 04

SPIRE Model: PFM

Tester: D. Rippington, T. Baillie, D. McNeill.

1. Test description:

Vibration Test and checks for damage and shifts in movement due to shake test of the Proto Flight Model.

2. Apparatus used:

PFM

Laser

ATC SPIRE brass feeler gauges

RAL Vibration test facility (see RAL shake test Report)

3. Notes on Test:

See attached RAL test Report for details of shake. Checks of shifts in movement were performed before and after the test, which showed no appreciable movement of the Beam Steering Mirror due to the shake.

There was some debris found to have come off the BSM unit during the shake – see relevant NCR for details of this.

4. Results:

The most likely movement of the structure is in the gimbal frame and the mirror rest position, so these are the areas that are measured.

Test for movement of jiggle frame:

Gap between jiggle frame and lower clamp before shake: 0.7mm medium sliding fit.

Gap between jiggle frame and lower clamp after shake: 0.7mm medium sliding fit.

Test for angular shift in rest position (warm- 290K):

Position of BSM mirror return spot with respect to alignment mirror return spot:

Before: 0.040 deg in negative chop only: no deviation in jiggle.

After: 0.030 deg in negative chop only: no deviation in jiggle.

These figures \pm 8%.

5. Conclusion:

No appreciable movement in the BSM Structure due to vibration test. See NCR for details of debris found from shake.



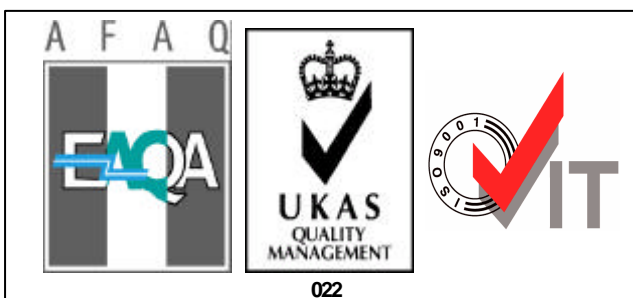
CCLRC

Rutherford Appleton Laboratory

SST DEPARTMENT
AIV FACILITY

SPIRE: Beam Steering Mirror

REPORT No: AIV-2004-016-VIB



**RUTHERFORD APPLETON LABORATORY
Vibration Facility**

Chilton,
Didcot,
Oxfordshire
OX11 0QX
Tel: 44 (0) 1235 446617

CONTENTS

1) TEST ITEM DESCRIPTION.....	3
2) TEST SPECIFICATION	3
3) PRE-TEST ACCELEROMETER VERIFICATION	5
4) CLEANLINESS	5
5) FIXTURE DETAILS.....	6
6) TEST SUMMARY.....	9
7) CONCLUSION	11
ANNEX A: ACCELEROMETER PLOTS FIGURES 1 – 15	

1) TEST ITEM DESCRIPTION

The test item consisted of the SPIRE Beam Steering Mirror (BSM) and was identified as PFM 1. All testing would be carried out on the head of the shaker.

2) TEST SPECIFICATION

The Qualification test specification levels were extracted from the ICD issue 4.0 dated October 2003. A sine survey was to be followed by a sine sweep, sine survey, random and a final sine survey for each axis. One Triaxial accelerometer would be used for monitoring.

SINE SURVEY TEST

One sweep @ 0.5g from 5 Hz to 2000 Hz at 2 octaves per minute.

X AXIS

SINE SWEEP TEST

FREQUENCY (Hz)	TEST LEVEL
25 - 60	22.5 g

One sweep at 2 octaves per minute.

Y AND Z AXES

SINE SWEEP TEST

FREQUENCY (Hz)	TEST LEVEL
25 - 60	15 g

One sweep at 2 octaves per minute.

RANDOM

X AXIS

FREQUENCY (Hz)	TEST LEVEL
20 - 100	+3 dB
100 - 200	0.04 g ² / Hz
200 - 2000	-3 dB

Overall Test Level = 4.9 g rms. for 1 minute

RANDOM

Y AXIS

FREQUENCY (Hz)	TEST LEVEL
20 - 100	+3 dB
100 - 200	0.05 g ² / Hz
200 - 2000	-5 dB

Overall Test Level = 4.4 g rms. for 1 minute

RANDOM

Z AXIS

FREQUENCY (Hz)	TEST LEVEL
20 - 100	+3 dB
100 - 200	0.06 g ² / Hz
200 - 2000	-3 dB

Overall Test Level = 6.1 g rms. for 1 minute

3) ACCELEROMETER CALIBRATION STATUS

Monitoring Accelerometers: -

ENDEVCO TRIAXIAL 65-10 Serial No. 10279

SERIAL NUMBER	CALIBRATION		SIGNAL CONDITIONER
	mV/g	Date	
10279 X	10.41	16/12/04	DYTRAN
10279 Y	9.61	16/12/04	MODEL E4121
10279 Z	10.95	16/12/04	SERIAL No. 225

Control Accelerometer : Endevco Type 7254A-10 (10.11 mV/g) Serial No. 11630
Calibration due: 09/06/04

Signal Conditioner : Dytran model E4121 Serial No. 225
Calibration due: 11/07/04

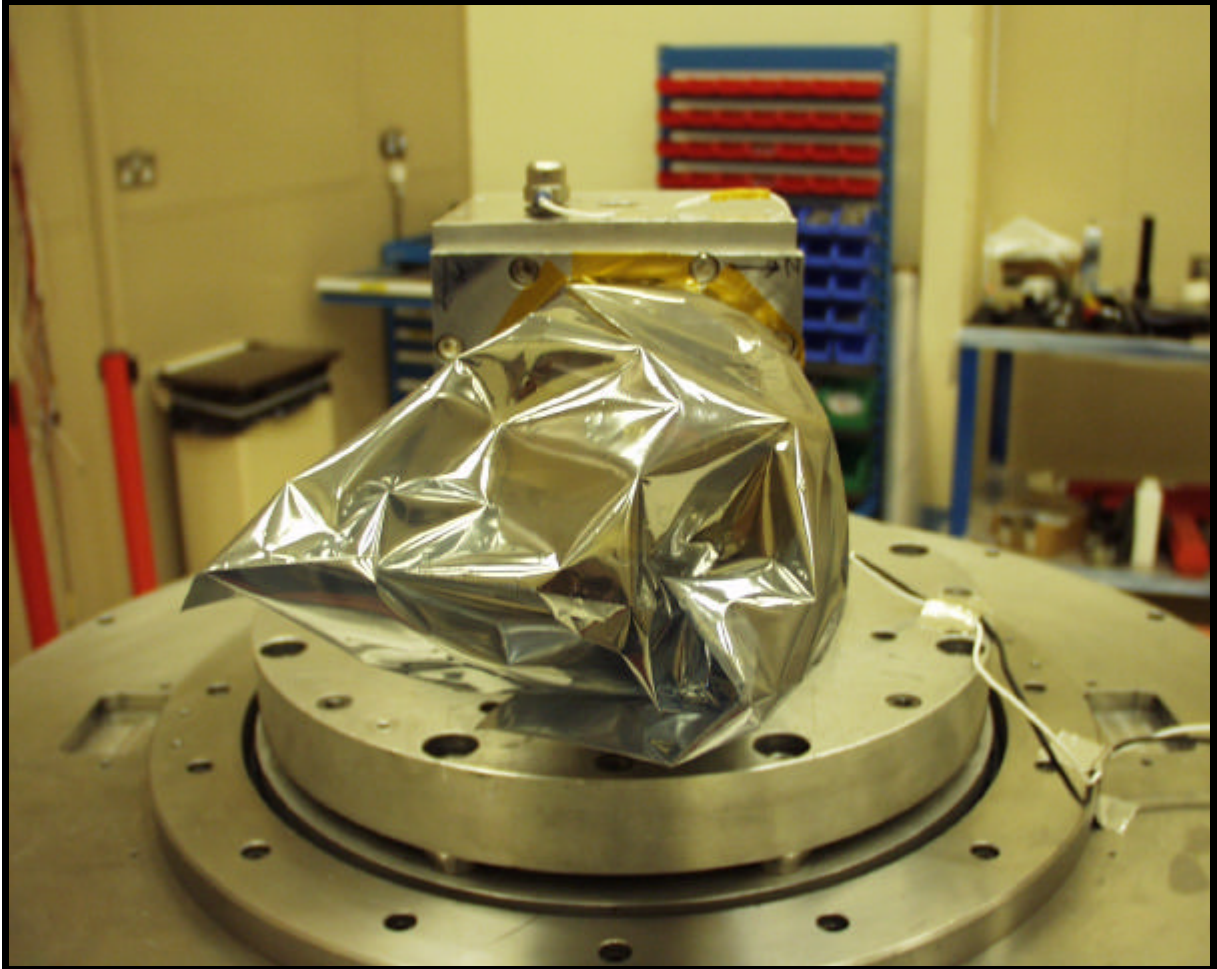
4) CLEANLINESS

Approved cleanroom gloves to be worn when handling the test item and it would remain bagged throughout testing.

5) FIXTURE DETAILS

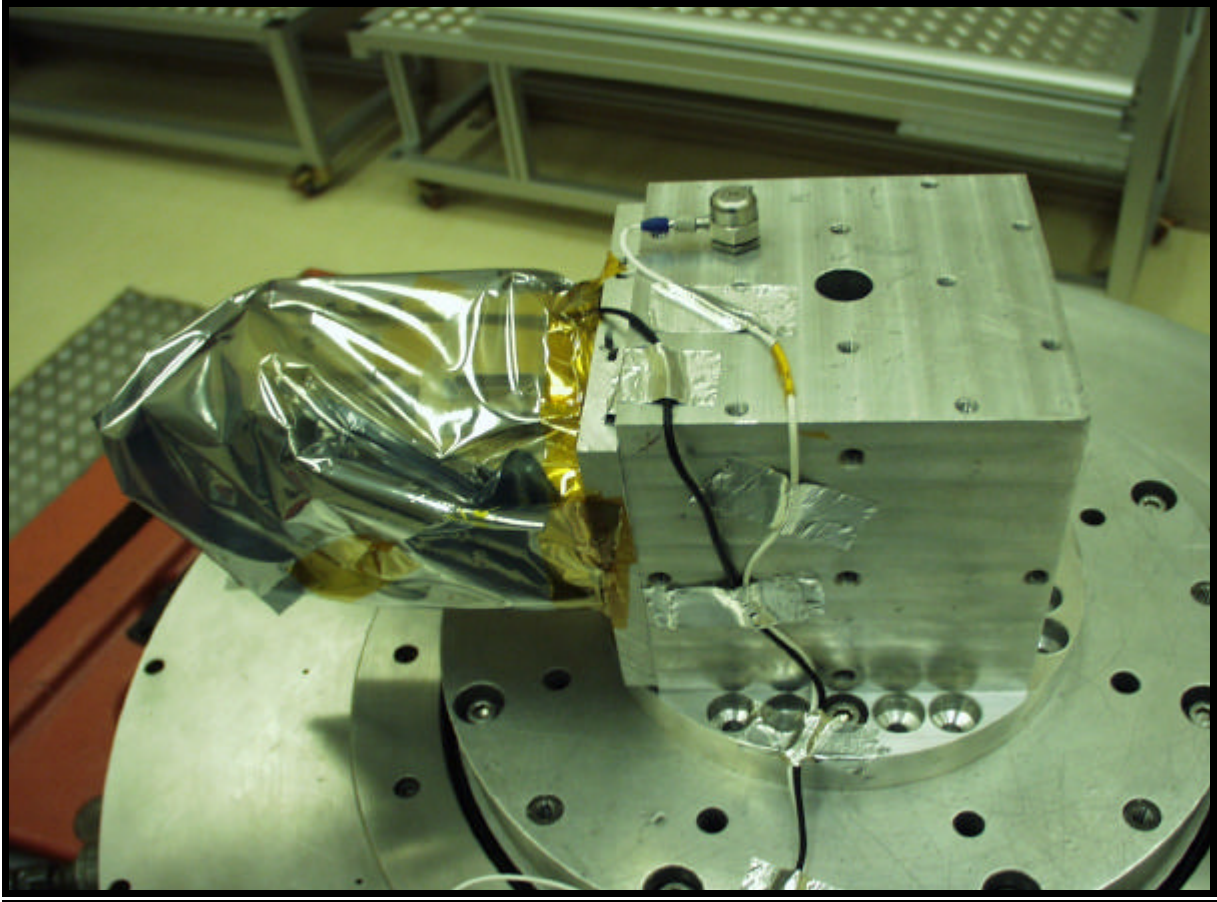
BSM

X AXIS VIBRATION TEST CONFIGURATION

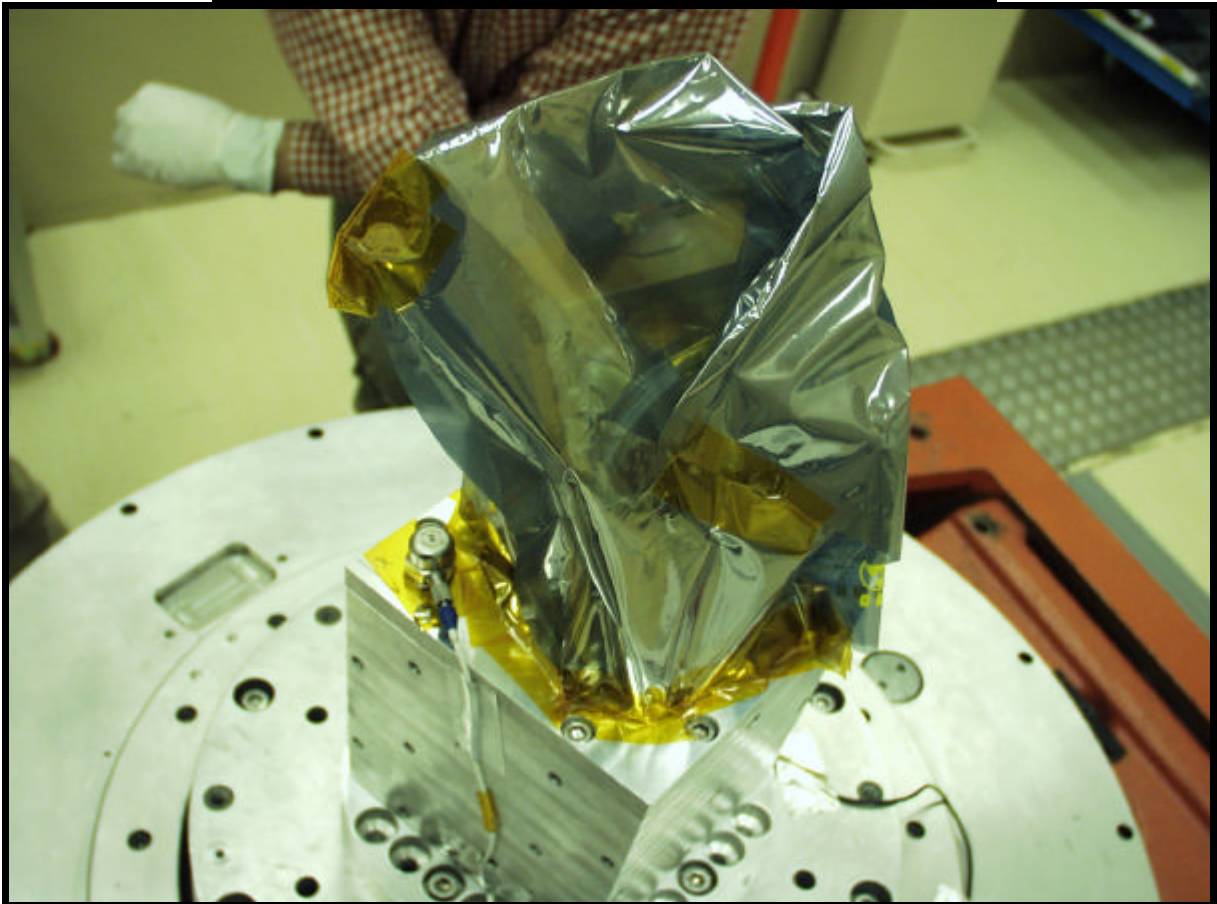


A view of the test item mounted on its vibration fixture.

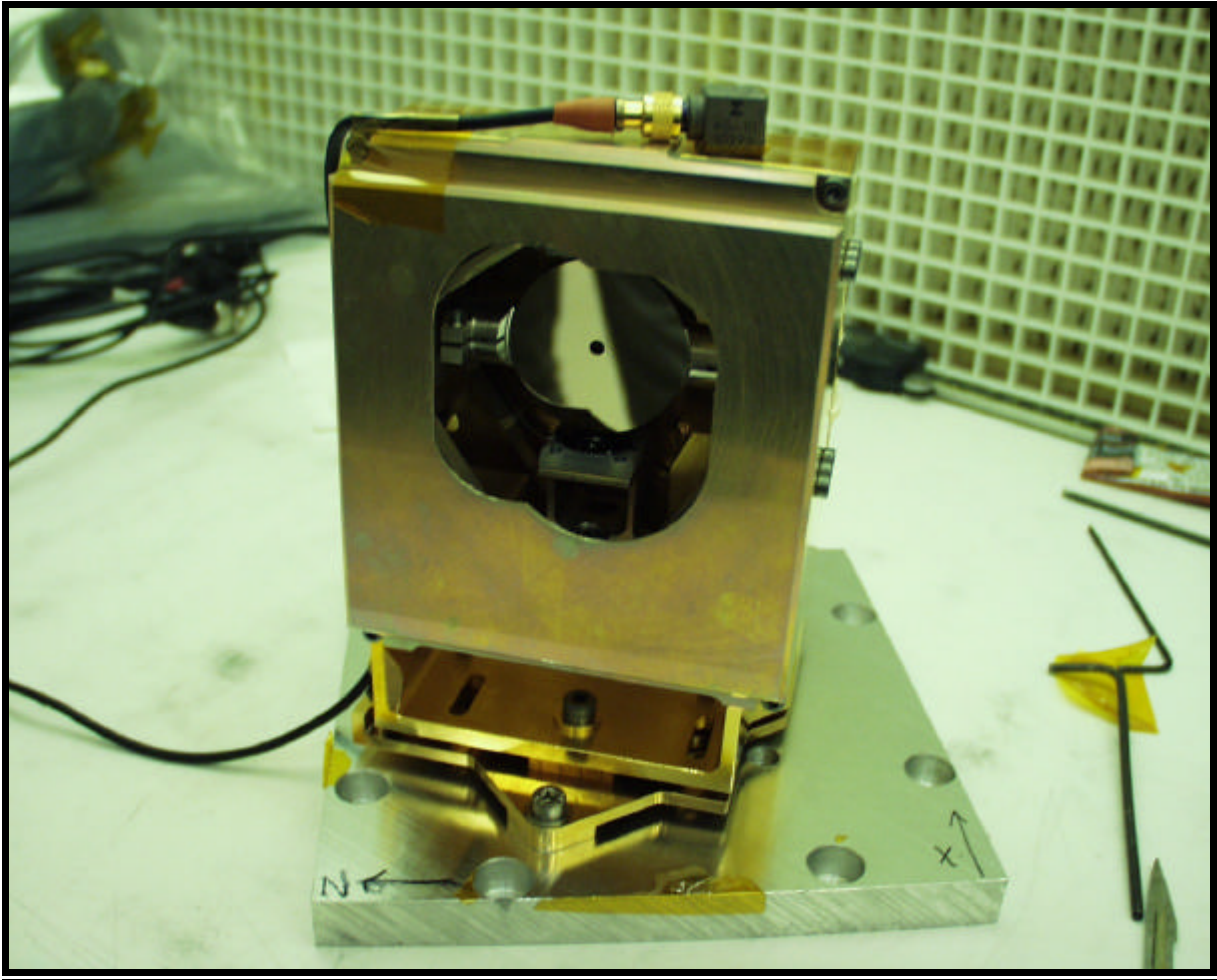
Z AXIS VIBRATION TEST CONFIGURATION



Y AXIS VIBRATION TEST CONFIGURATION



The BSM showing the location of the monitoring Accelerometer



6) TEST SUMMARY

Test Date: 27 February 2004

Observers: David Mcneill (ROE) and Doug Griffin (RAL)

Organisation : UK Astronomy Technology Centre
Royal Observatory
Blackford Hill
Edinburgh
EH9 3HJ

CHANNEL ALLOCATION:

CONTROL:-

Channel No.	Accelerometer Type/Serial No.	Testing Axis	Mounting Position
1	Endevco 11630	In Axis	Fixture

MONITORING:-

Channel No.	Accelerometer Type/Serial No.	Testing Axis	Mounting Position
2	Endevco 10279 X	Z	Structure Top
3	Endevco 10279 Y	X	Structure Top
4	Endevco 10279 Z	Y	Structure Top

NOTE

On completion of the sine sweep in the Z axis (Fig 7) it was observed that some debris was present within the test item bagged enclosure. The test item was removed from the fixture for further investigation. The largest component of the debris appeared to be a piece of heatshrink, also there were some small pieces of tinned copper wire.

ACCELEROMETER TEST PLOTS

VIBRATION TESTS in the X-axis

RUN 00001 SINE SURVEY FIG 1

RUN 00001 SINE SWEEP FIG 2

RUN 00002 POST SINE SWEEP SINE SURVEY FIG 3

RUN 00001 RANDOM FIG 4

RUN 00003 POST RANDOM SINE SURVEY FIG 5

VIBRATION TESTS in the Z-axis

RUN 00004 SINE SURVEY FIG 6

RUN 00001 SINE SWEEP FIG 7

RUN 00005 POST SINE SWEEP SINE SURVEY FIG 8

RUN 00001 RANDOM FIG 9

RUN 00006 POST RANDOM SINE SURVEY FIG 10

VIBRATION TESTS in the Y-axis

RUN 00007 SINE SURVEY FIG 11

RUN 00002 SINE SWEEP FIG 12

RUN 00008 POST SINE SWEEP SINE SURVEY FIG 13

RUN 00001 RANDOM FIG 14

RUN 00009 POST RANDOM SINE SURVEY FIG 15

7) CONCLUSION

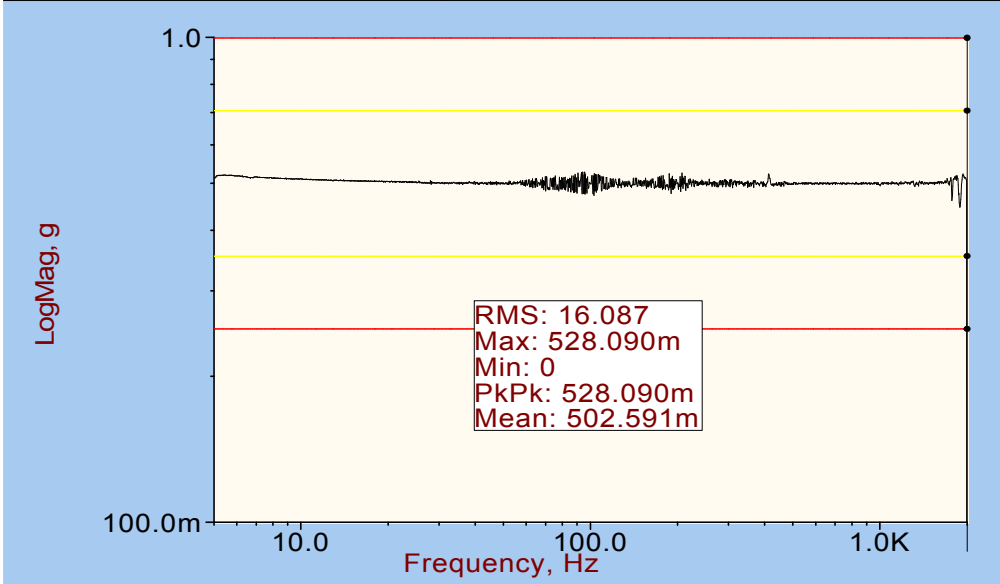
The test items were subjected to the Qualification levels of vibration extracted from the ICD issue 4.0 dated October 2003. No visible damage occurred to the BSM. The debris collected after the Z axis sine sweep test is shown below: - (the largest component, black heatshrink, being approx. 4mm in length)



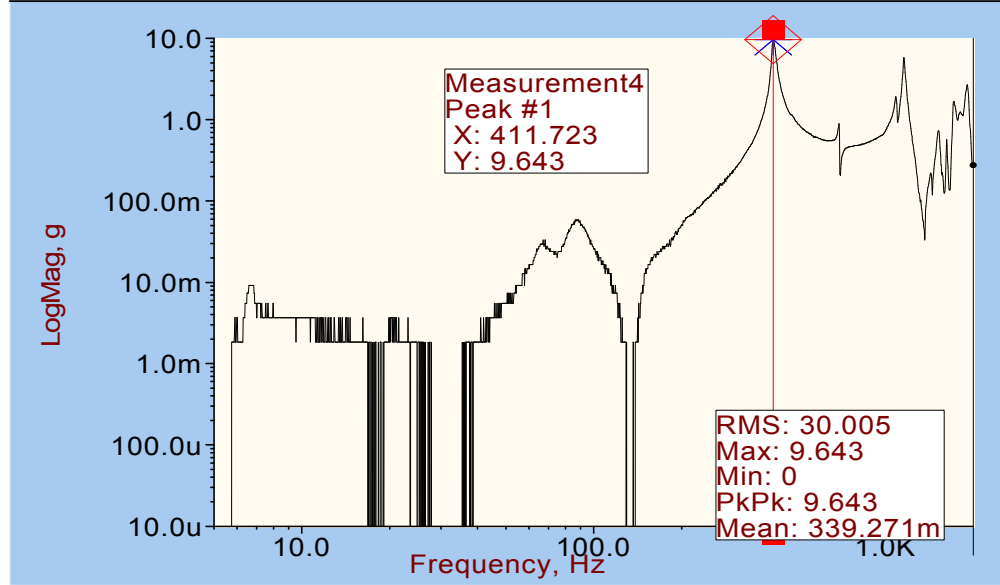
FACILITY OPERATOR: -

ANNEX:A ACCELEROMETER PLOTS

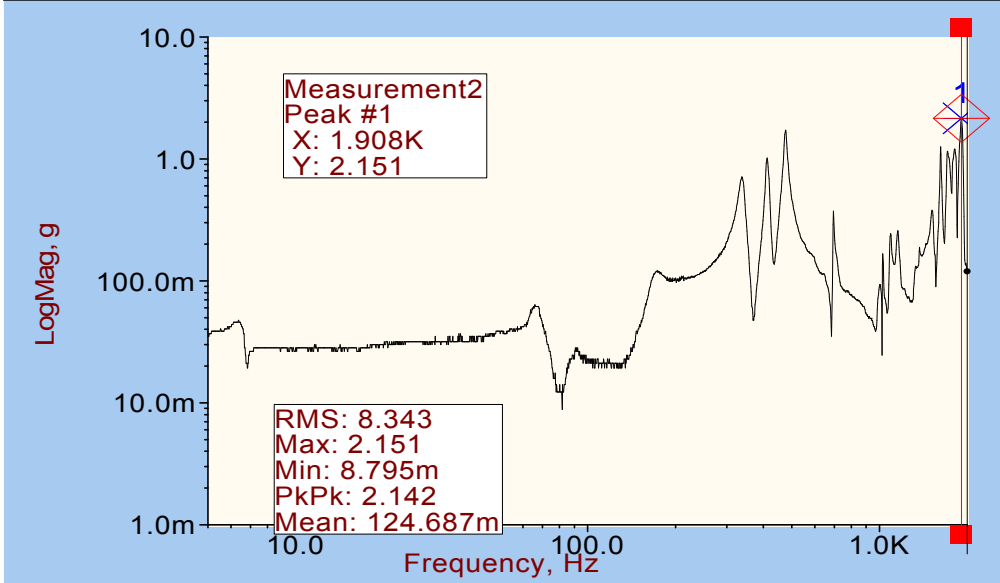
Control;AlarmLow;AlarmHigh;AbortLow;Abo



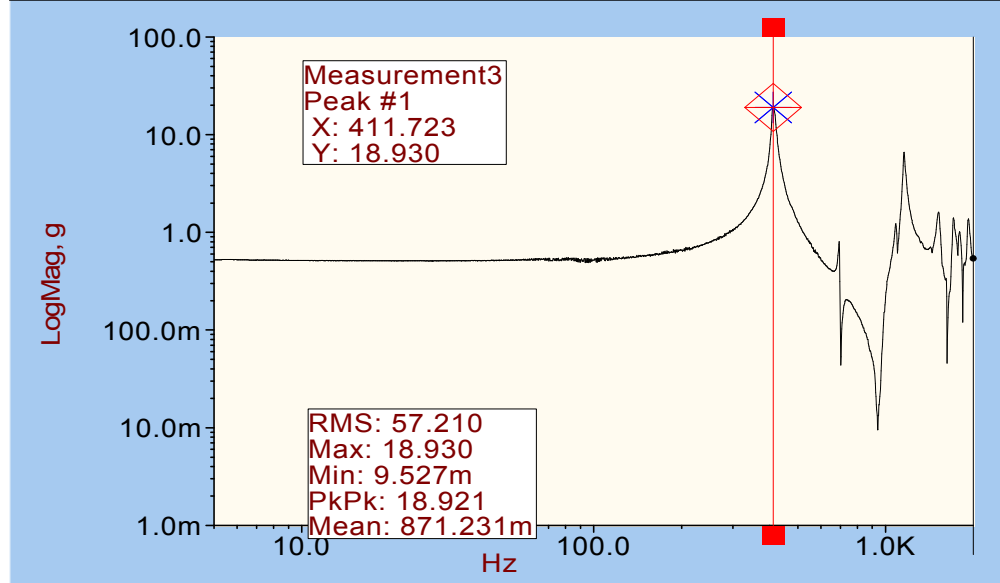
STRUCTURE TOP Y AXIS



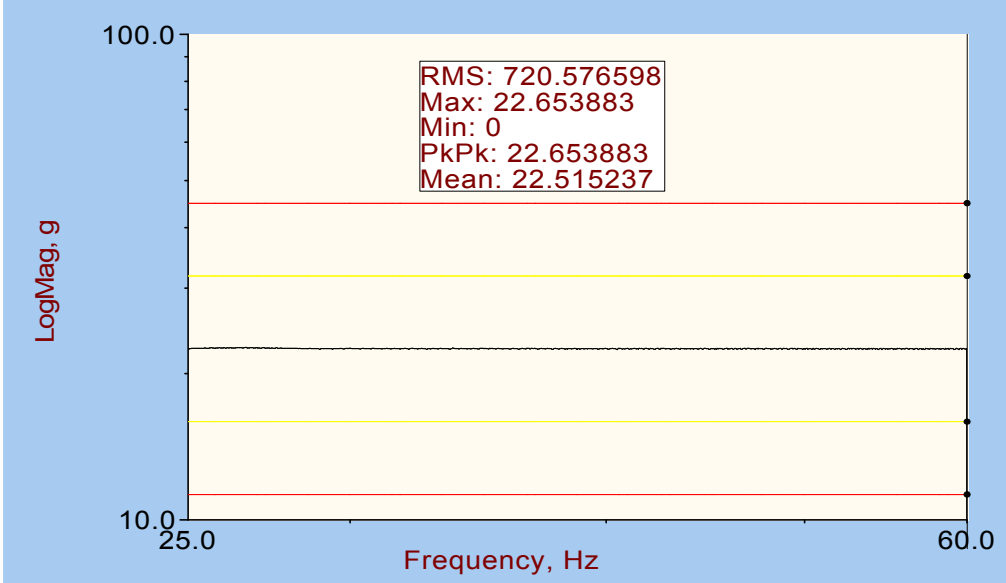
STRUCTURE TOP Z AXIS



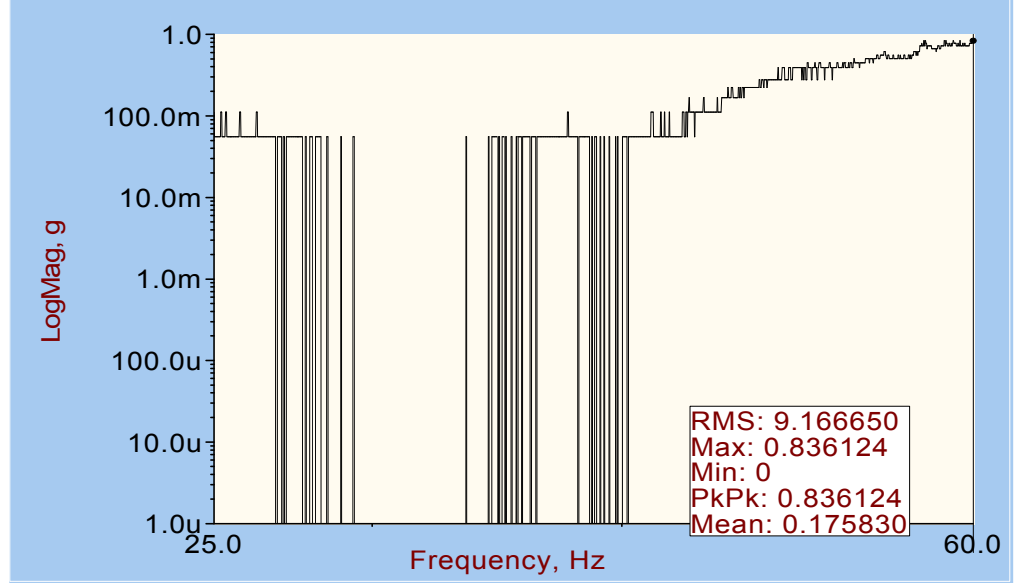
STRUCTURE TOP X AXIS



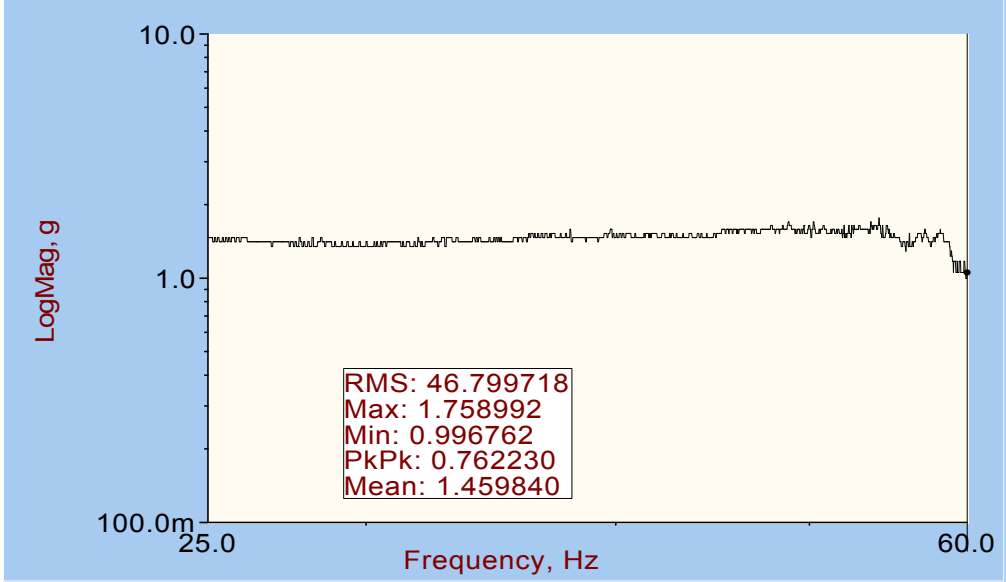
Control;AlarmLow;AlarmHigh;AbortLow;Abo



STRUCTURE TOP Y AXIS



STRUCTURE TOP Z AXIS



STRUCTURE TOP X AXIS

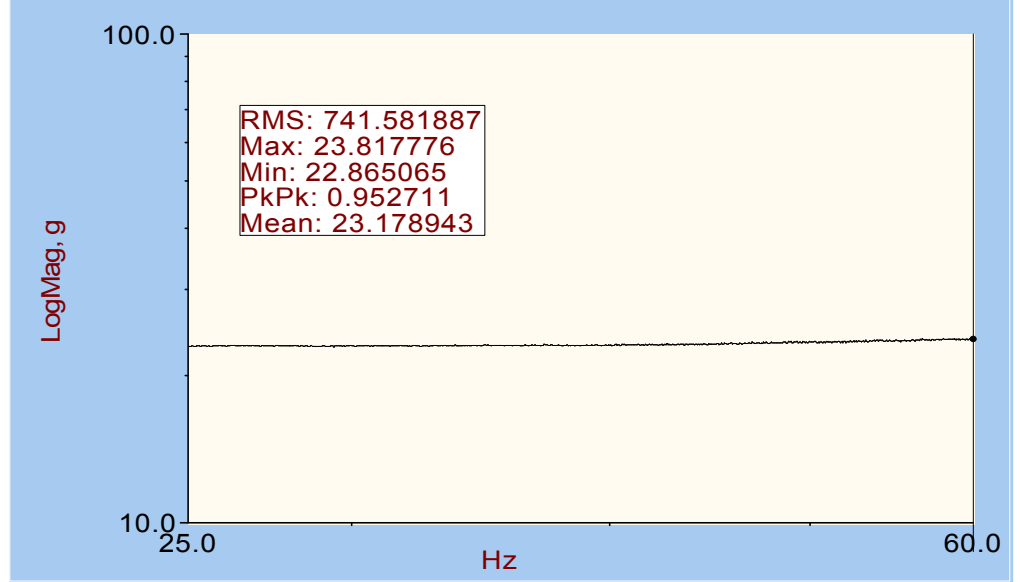
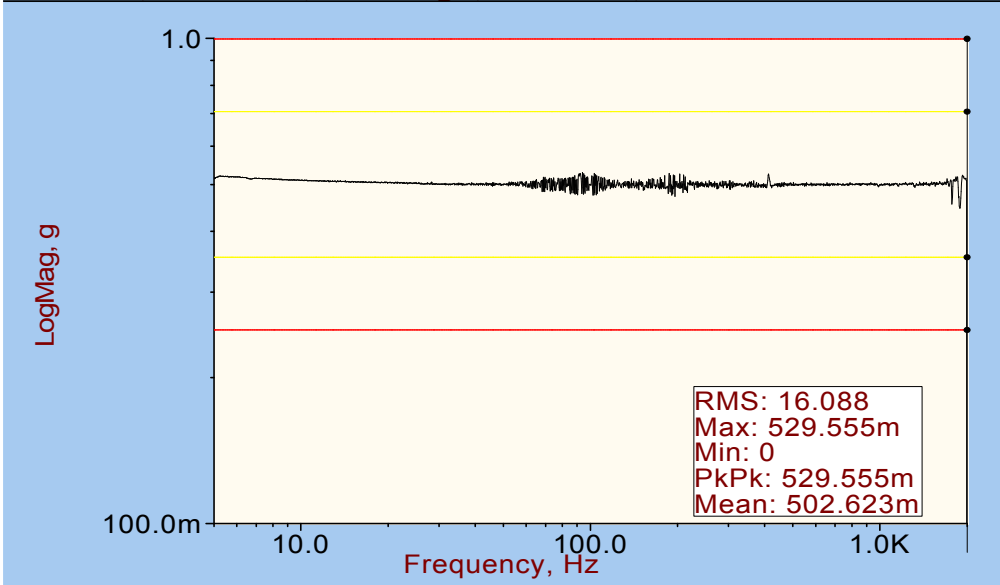
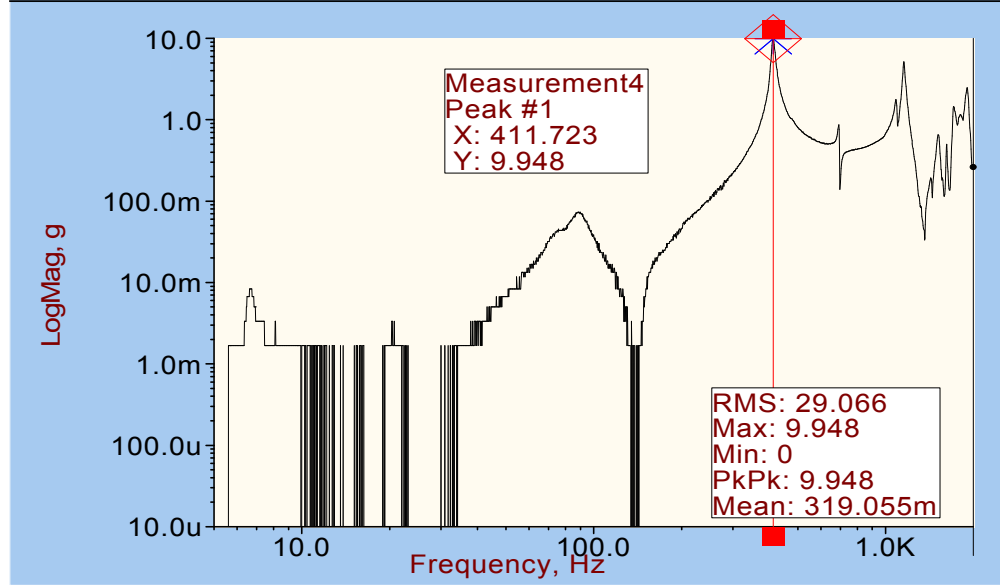


Fig 2

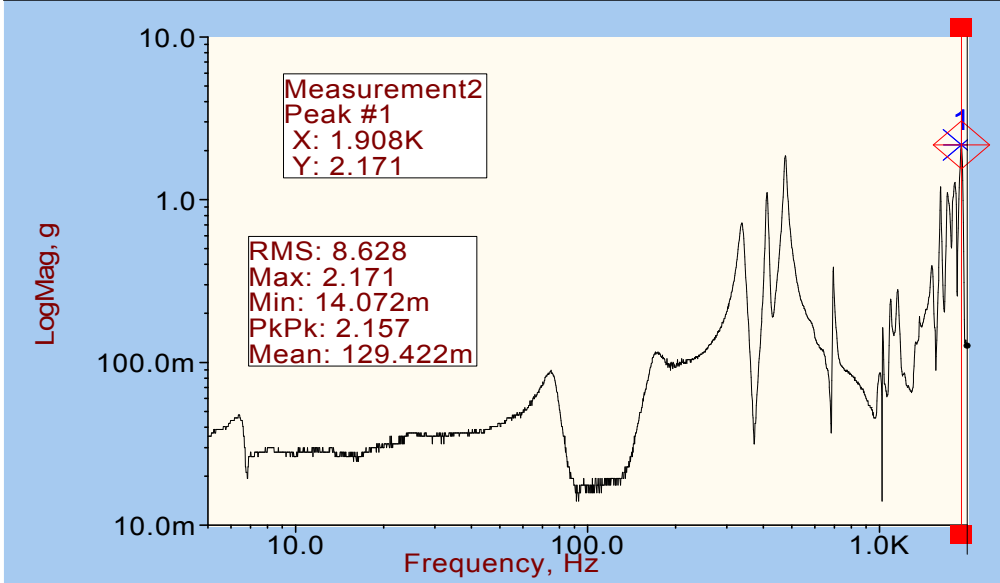
Control;AlarmLow;AlarmHigh;AbortLow;Abo



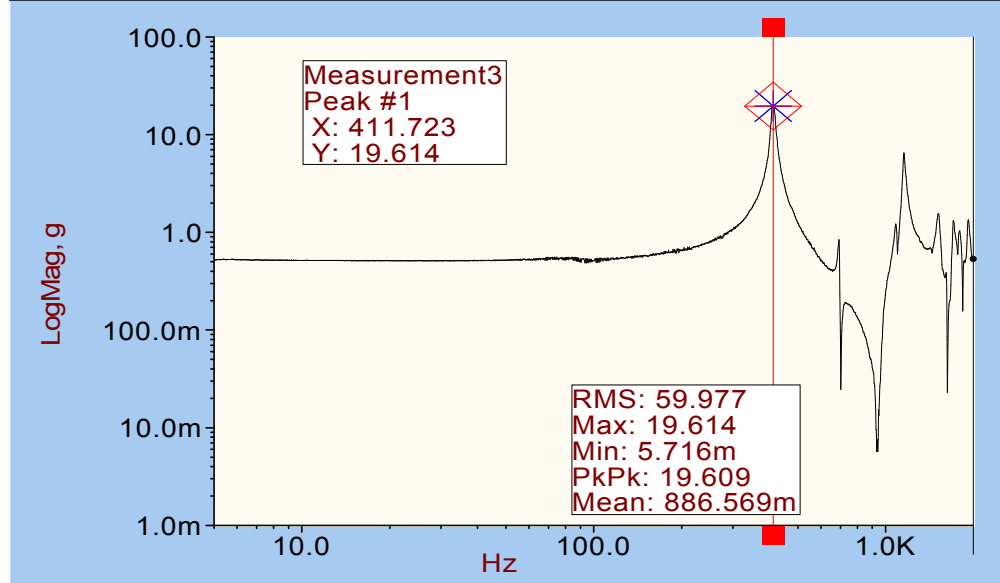
STRUCTURE TOP Y AXIS



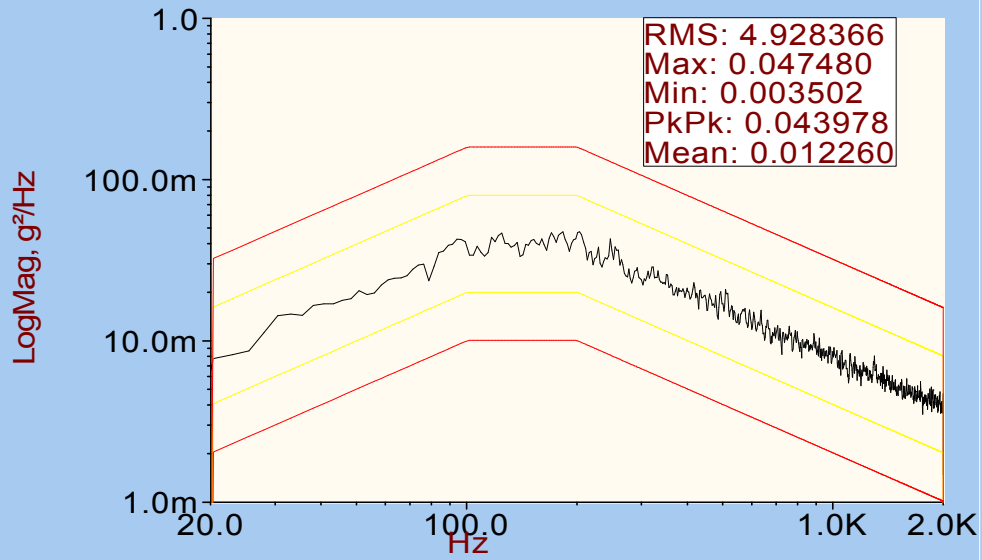
STRUCTURE TOP Z AXIS



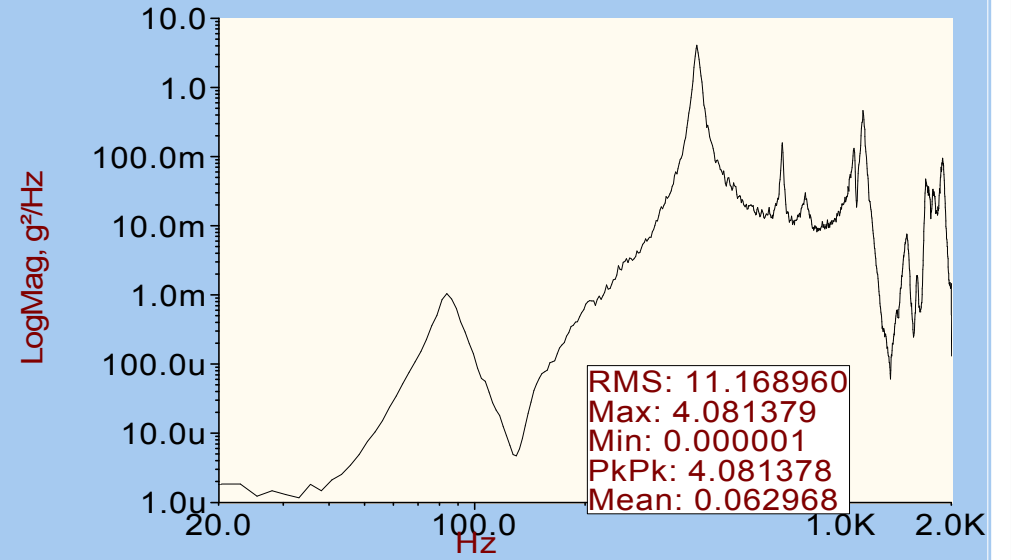
STRUCTURE TOP X AXIS



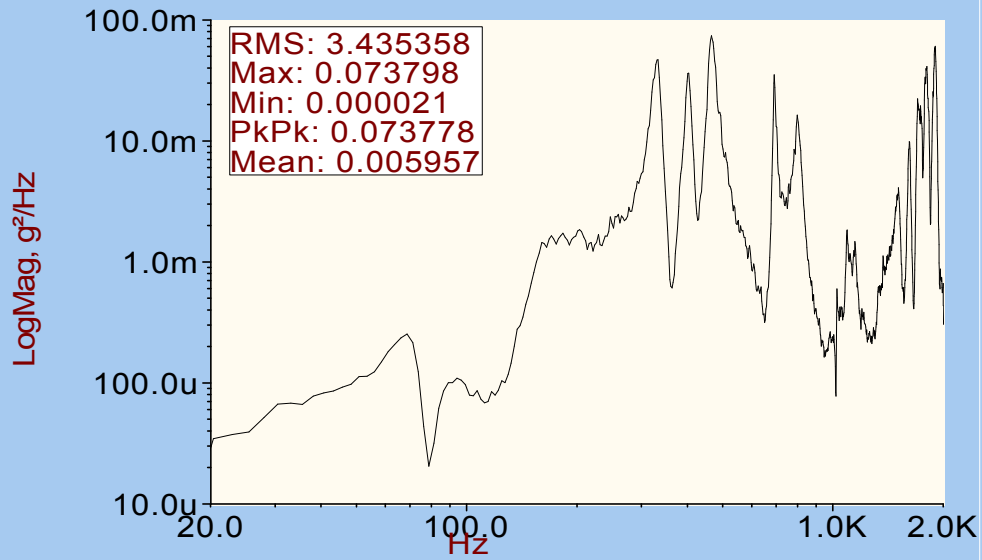
STRUCTURE TOP Y AXIS



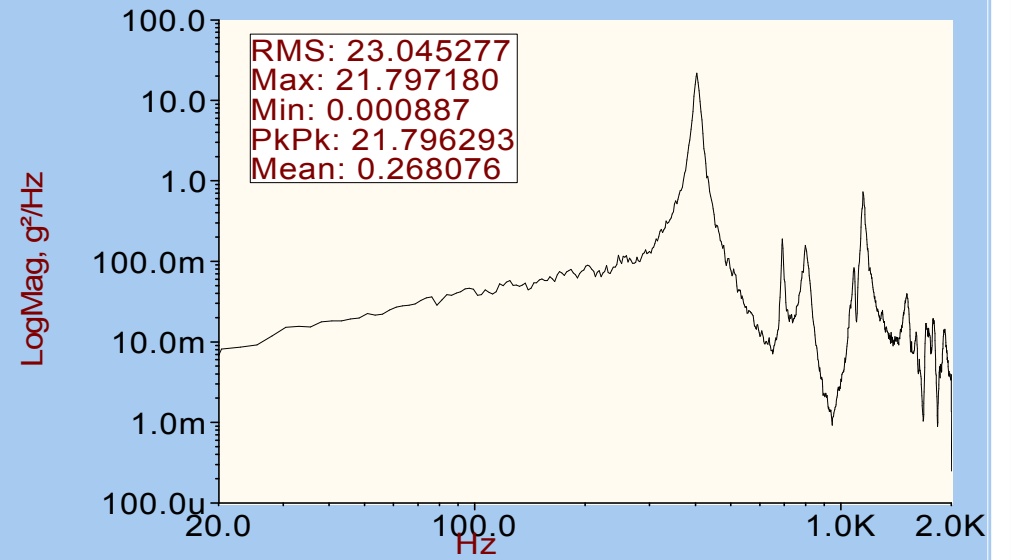
STRUCTURE TOP Y AXIS



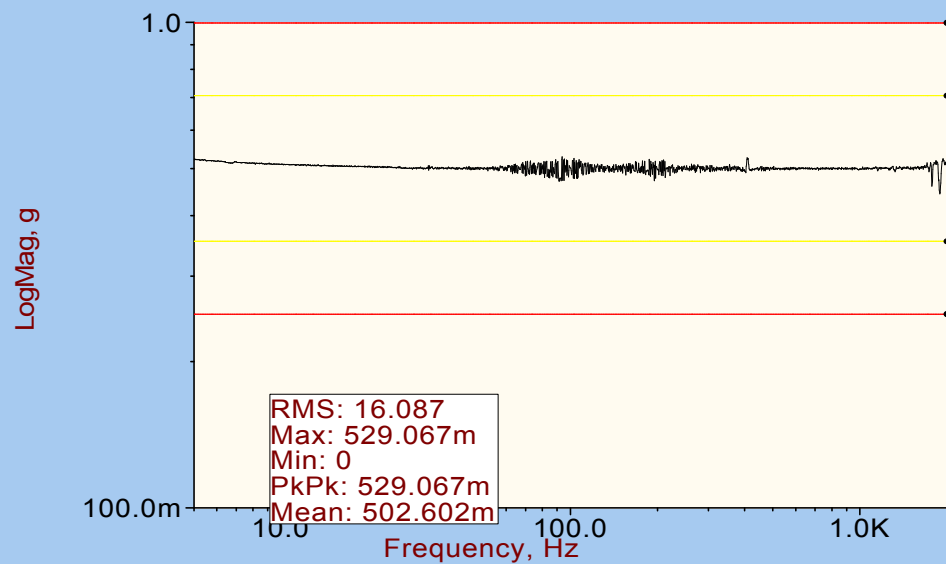
STRUCTURE TOP Z AXIS



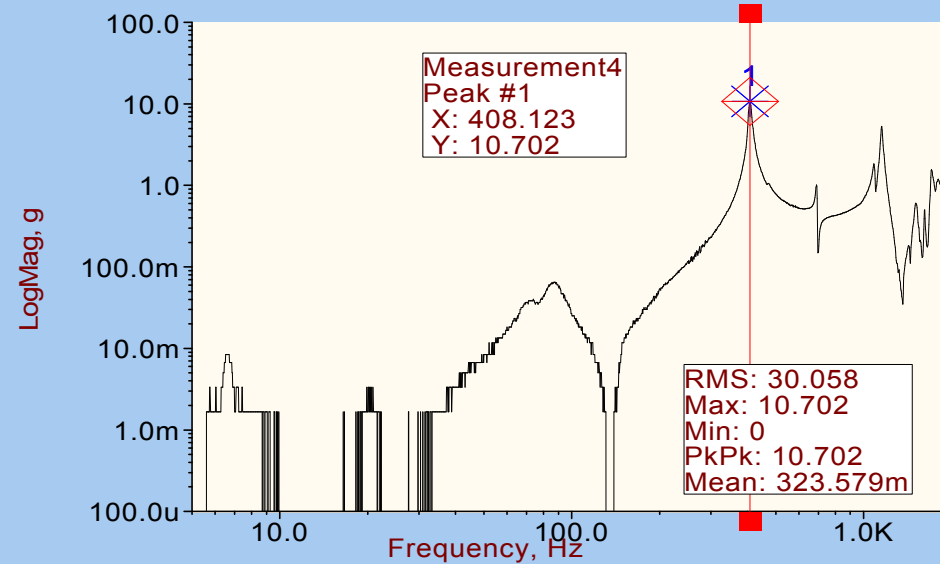
STRUCTURE TOP X AXIS



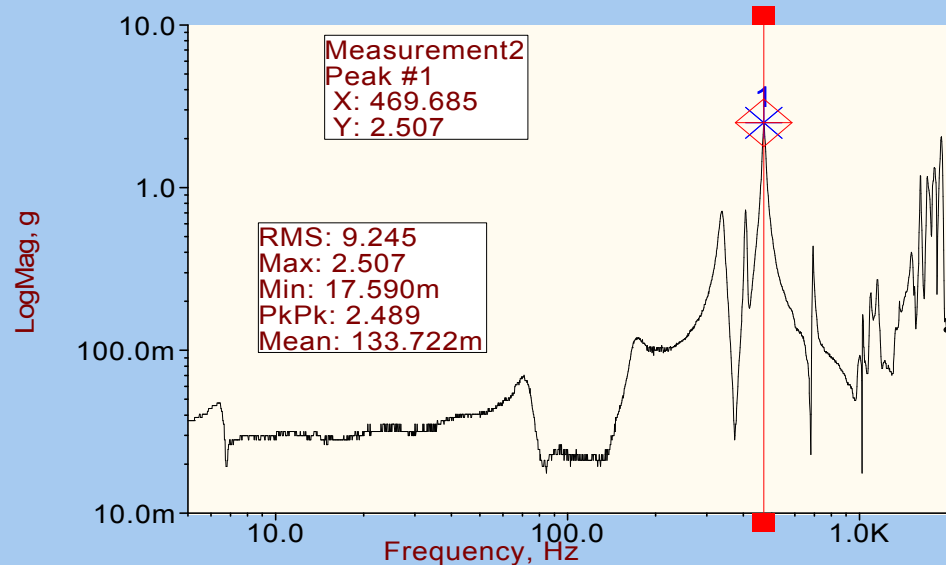
Control;AlarmLow;AlarmHigh;AbortLow;Abo



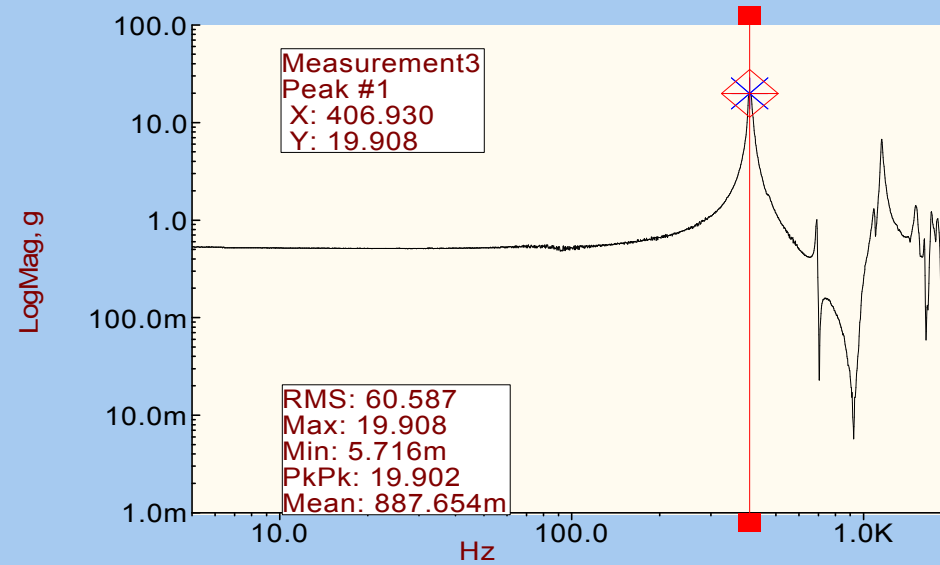
STRUCTURE TOP Y AXIS



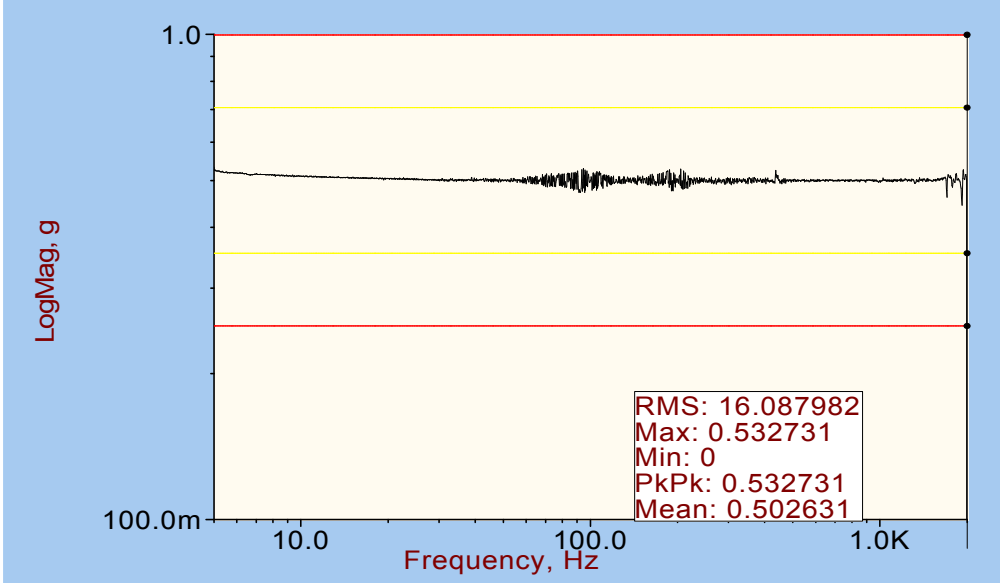
STRUCTURE TOP Z AXIS



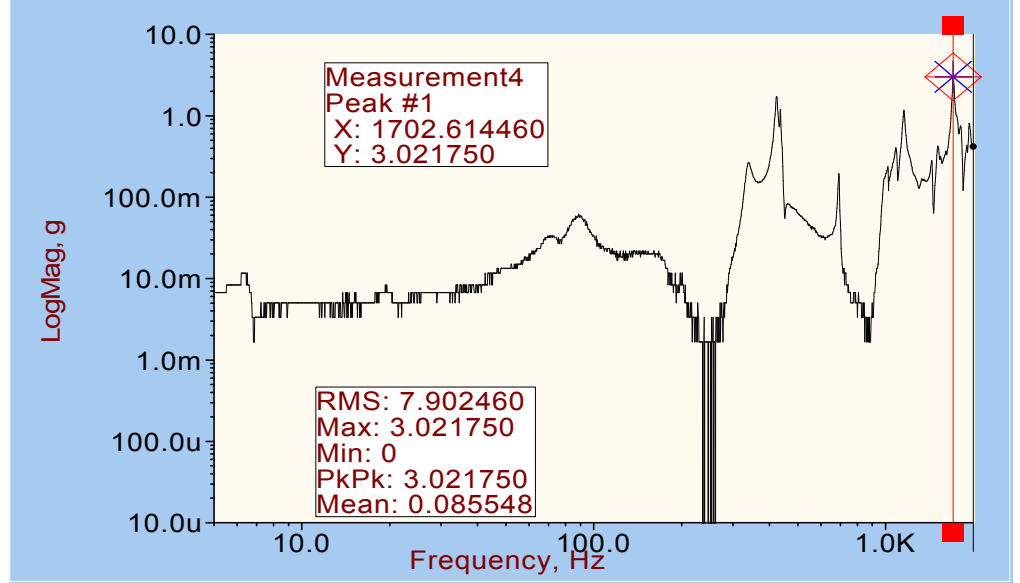
STRUCTURE TOP X AXIS



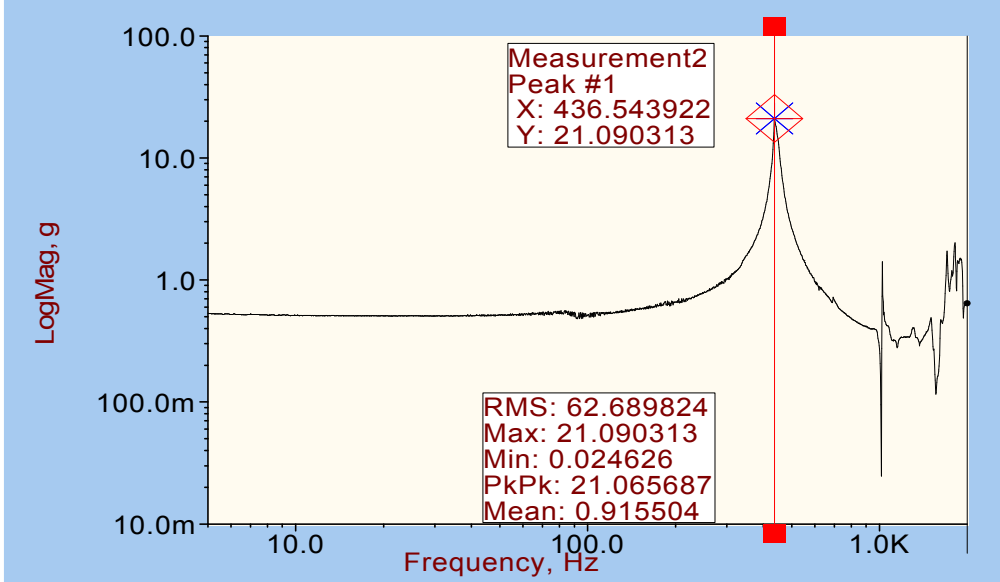
Control;AlarmLow;AlarmHigh;AbortLow;Abo



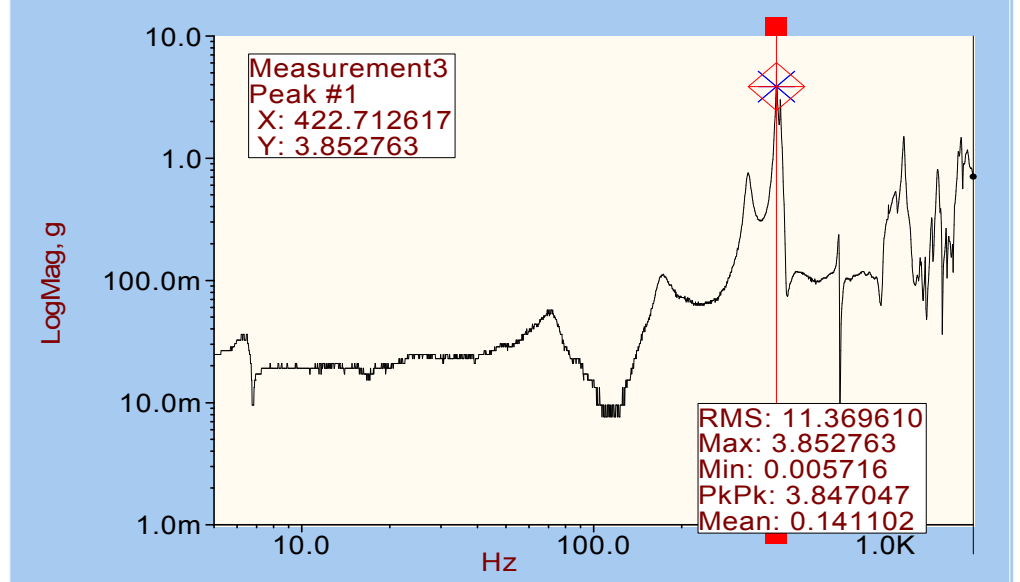
STRUCTURE TOP Y AXIS



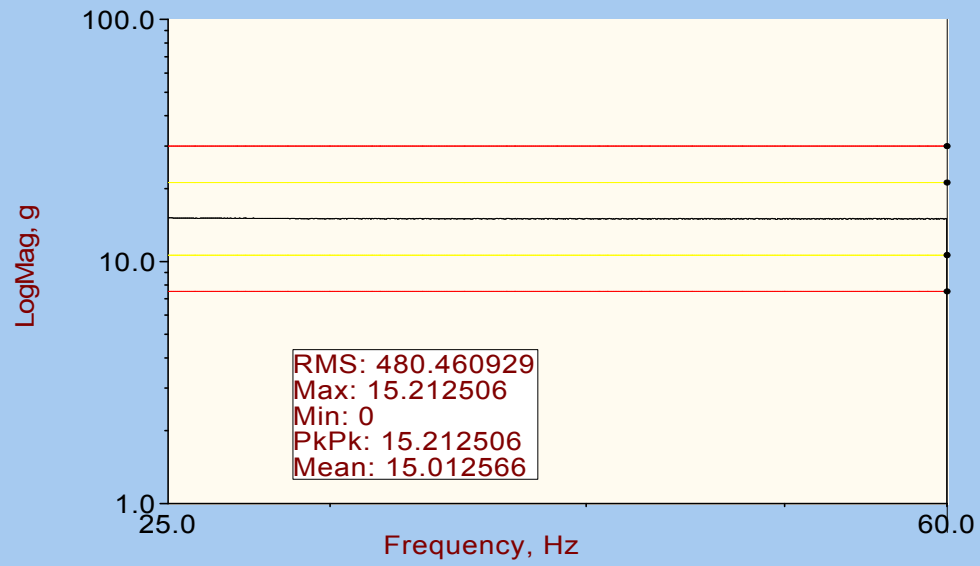
STRUCTURE TOP Z AXIS



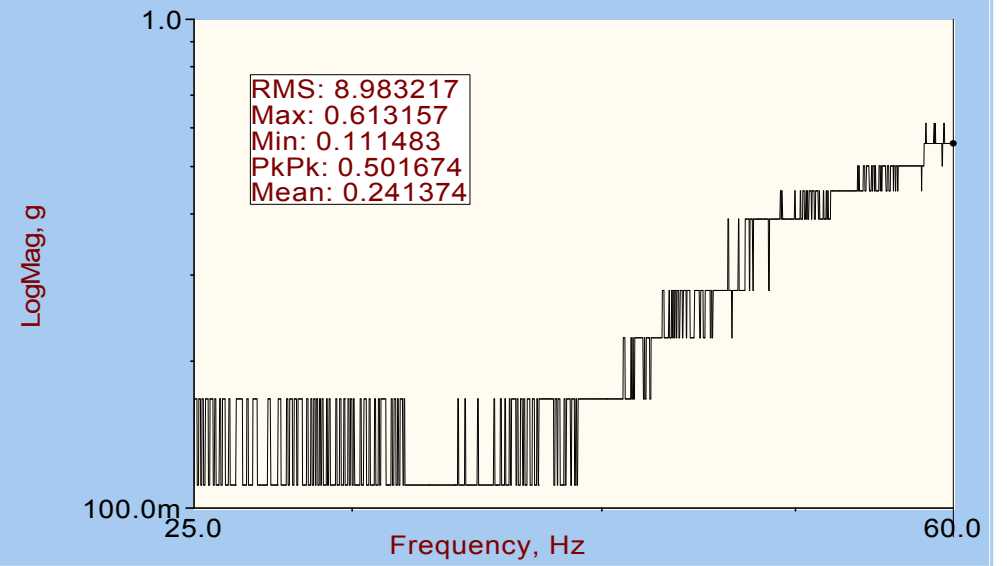
STRUCTURE TOP X AXIS



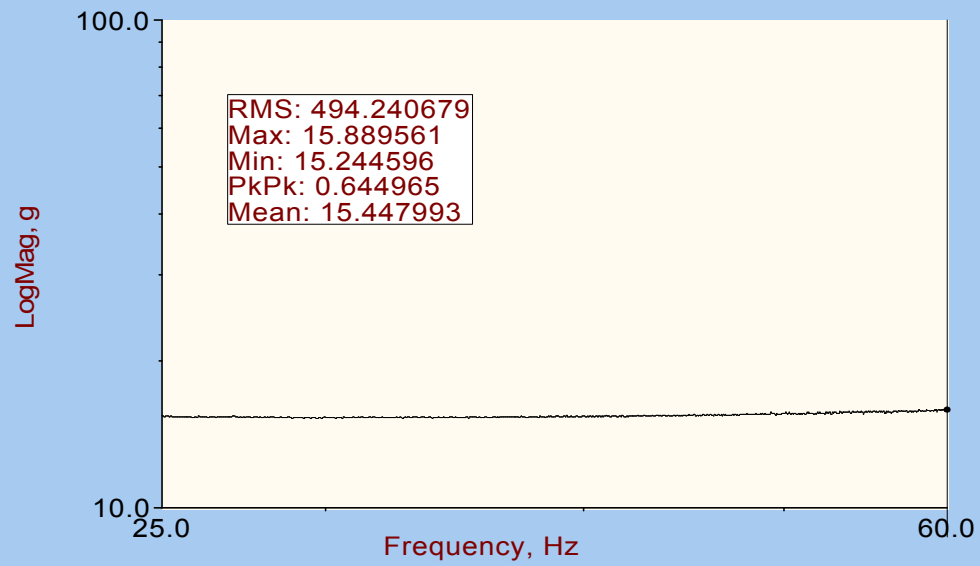
Control;AlarmLow;AlarmHigh;AbortLow;Abo



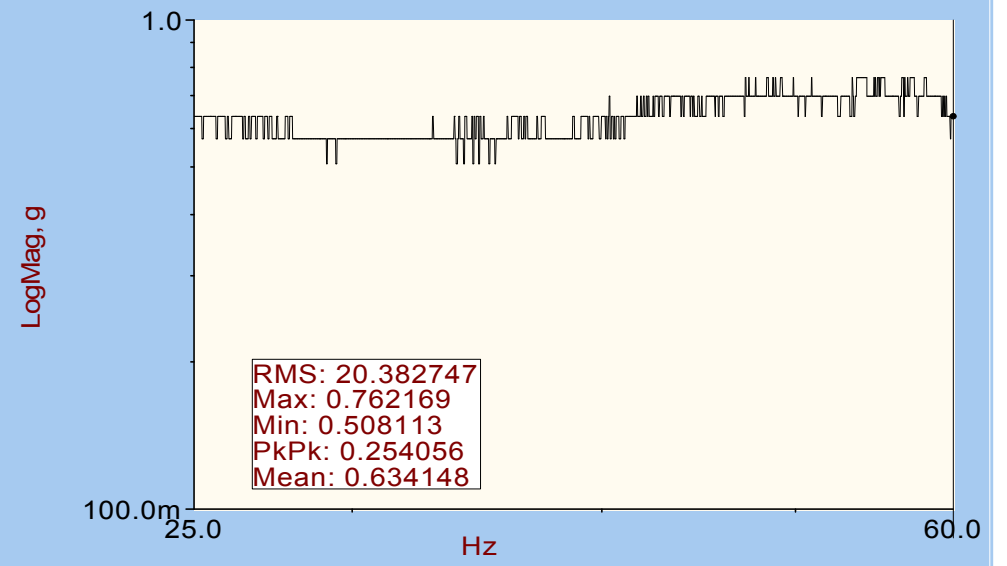
STRUCTURE TOP Y AXIS



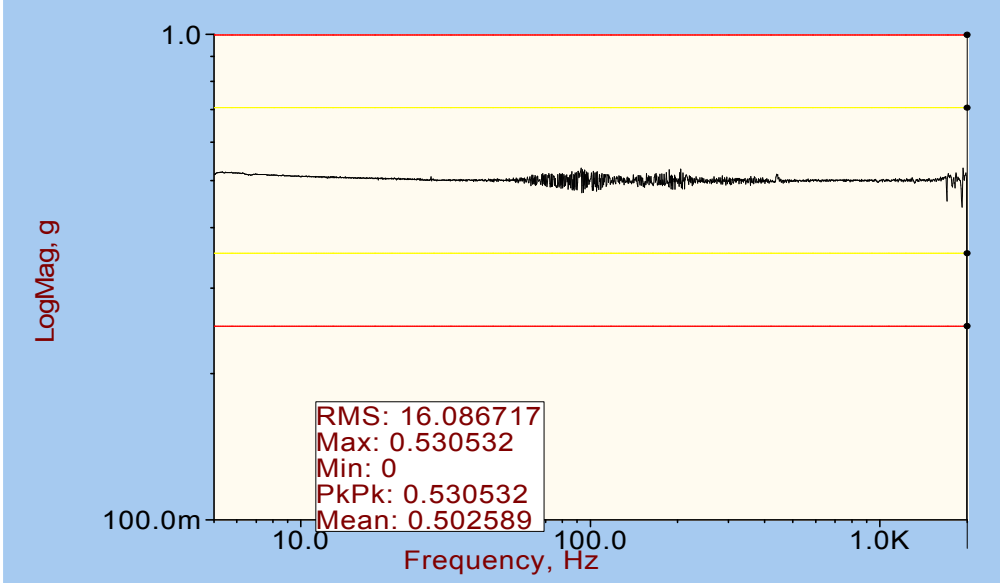
STRUCTURE TOP Z AXIS



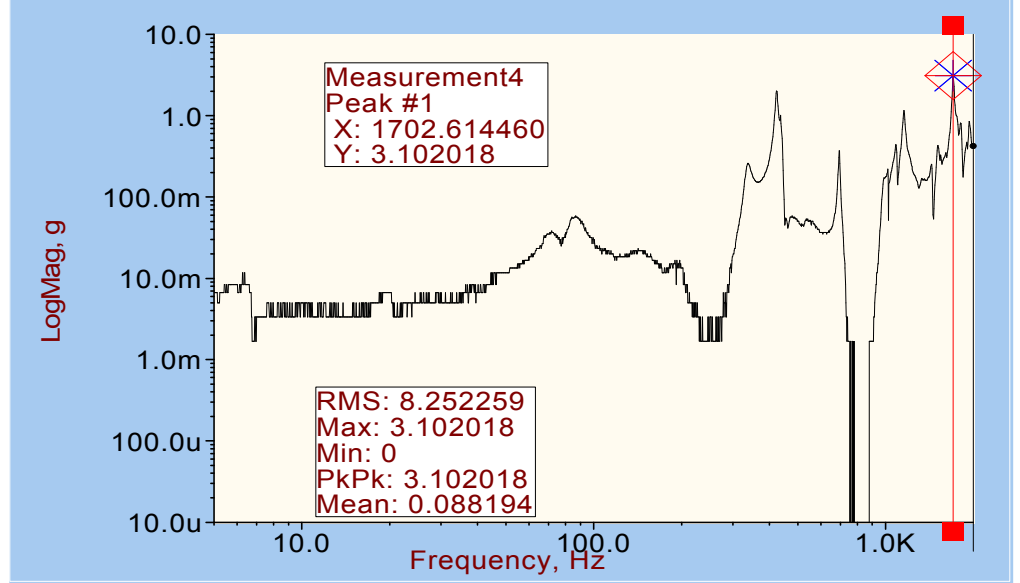
STRUCTURE TOP X AXIS



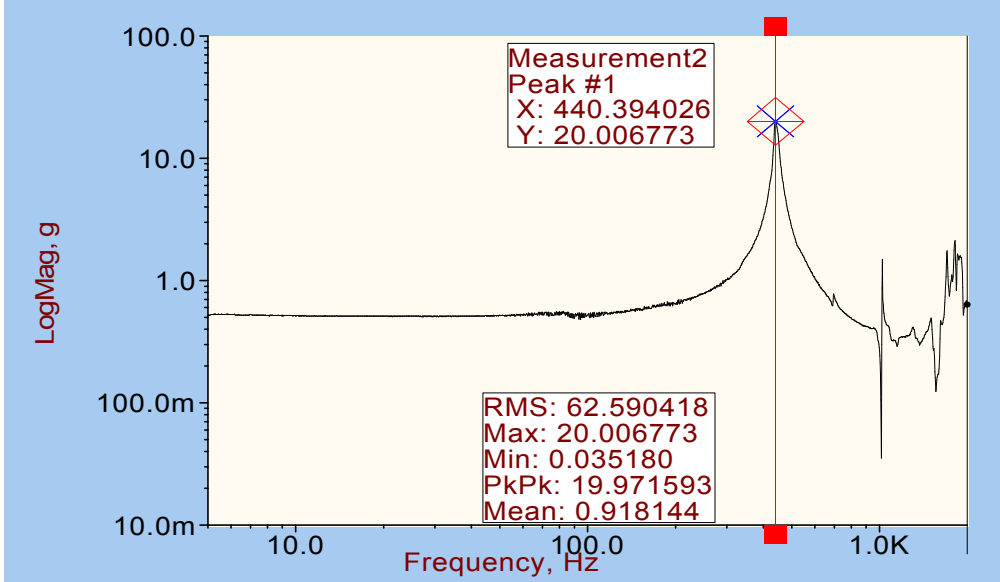
Control;AlarmLow;AlarmHigh;AbortLow;Abo



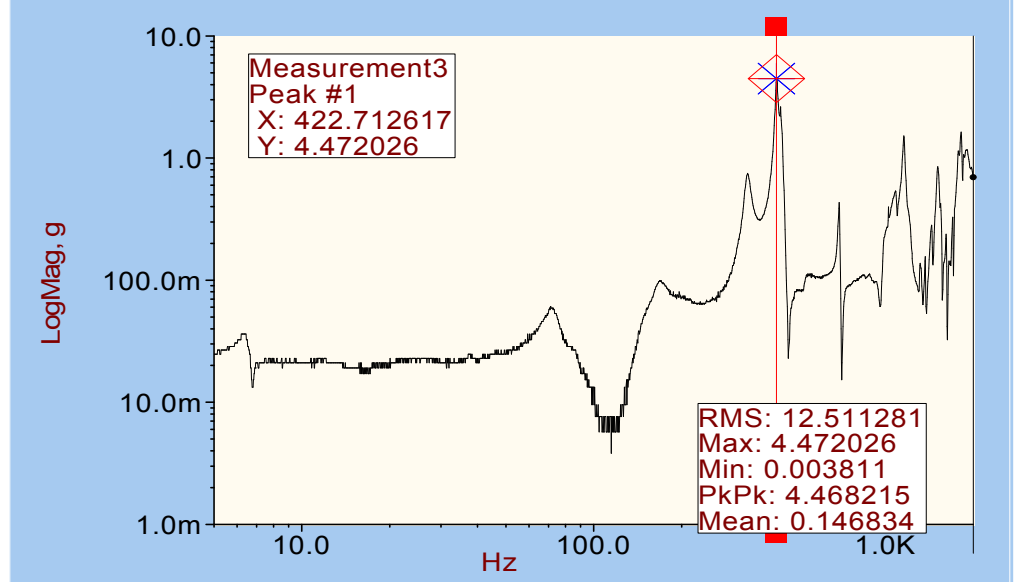
STRUCTURE TOP Y AXIS



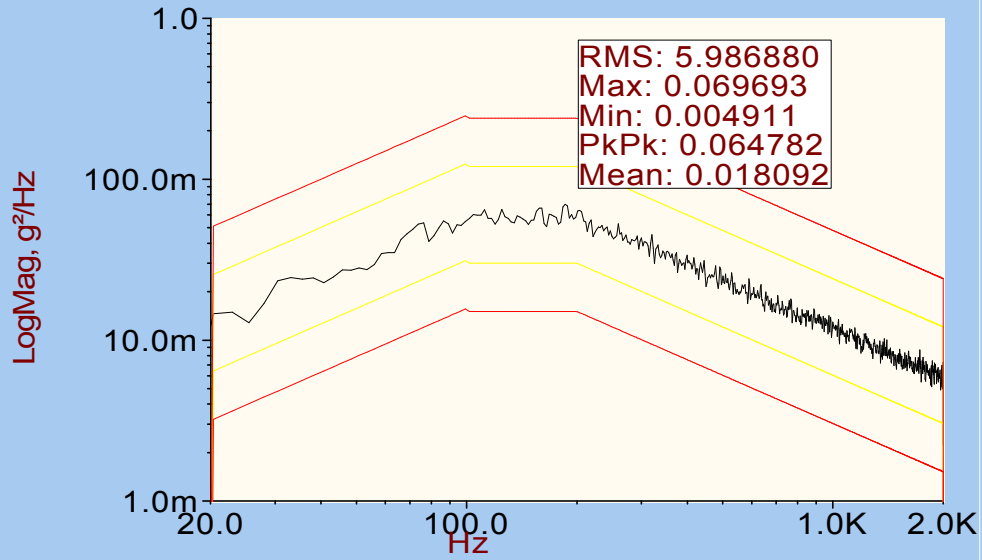
STRUCTURE TOP Z AXIS



STRUCTURE TOP X AXIS



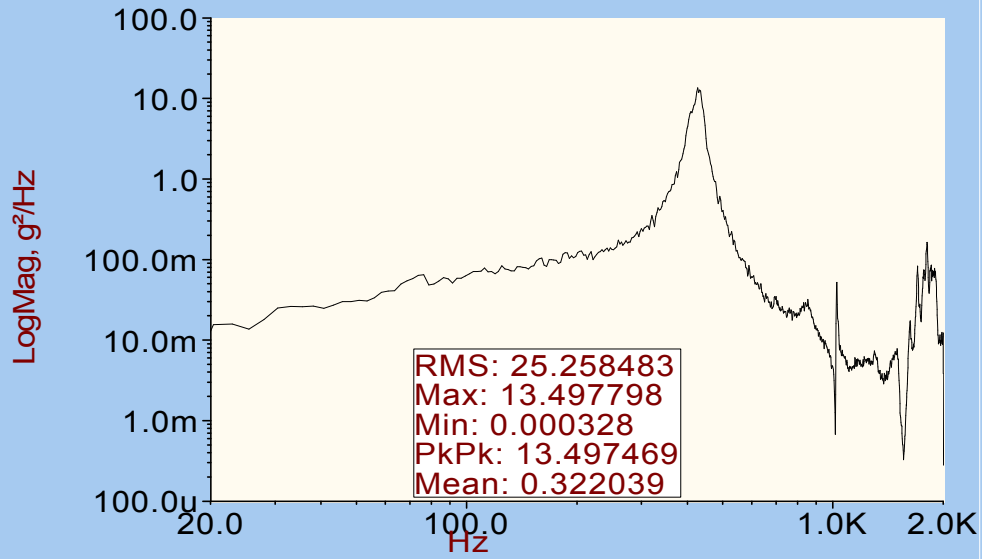
STRUCTURE TOP Y AXIS



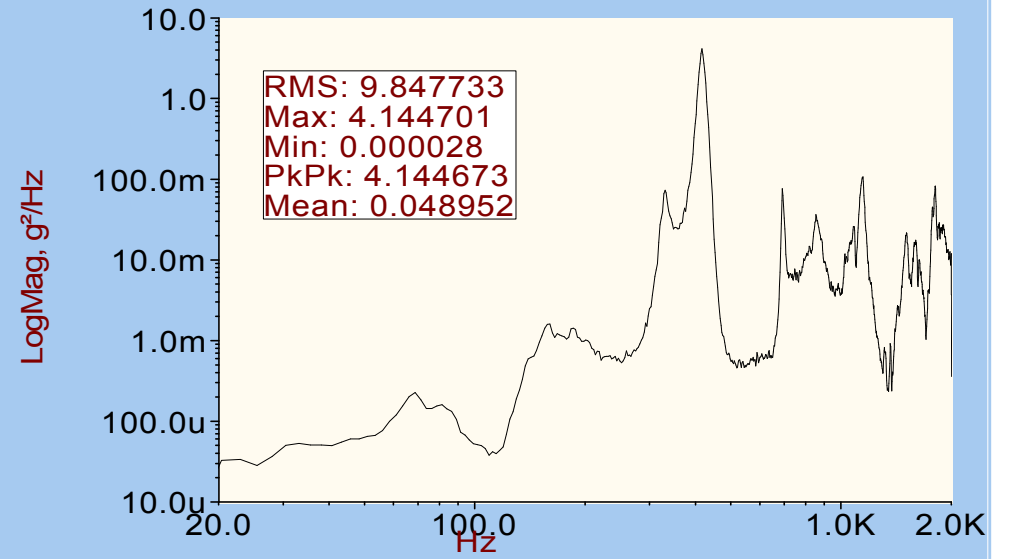
STRUCTURE TOP Y AXIS



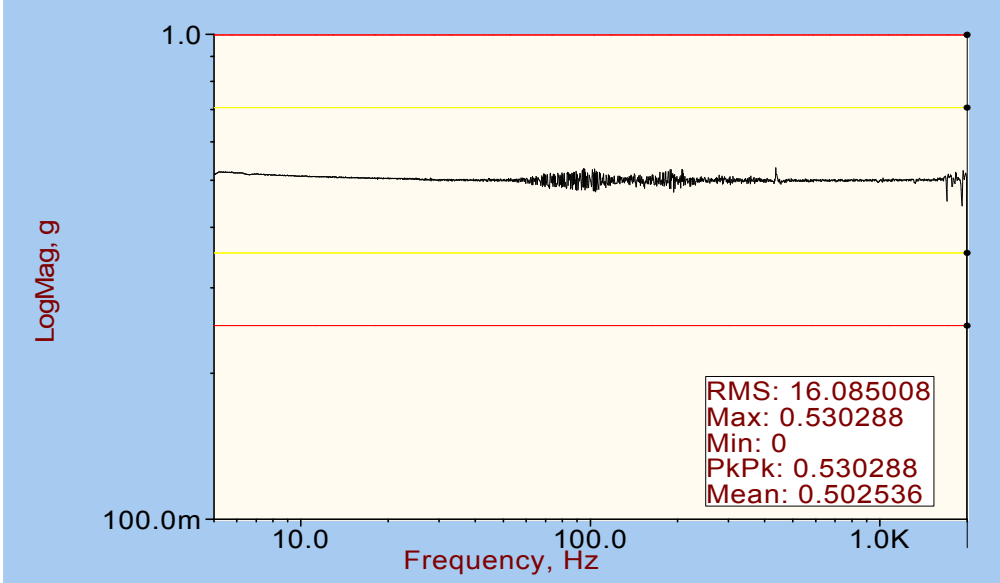
STRUCTURE TOP Z AXIS



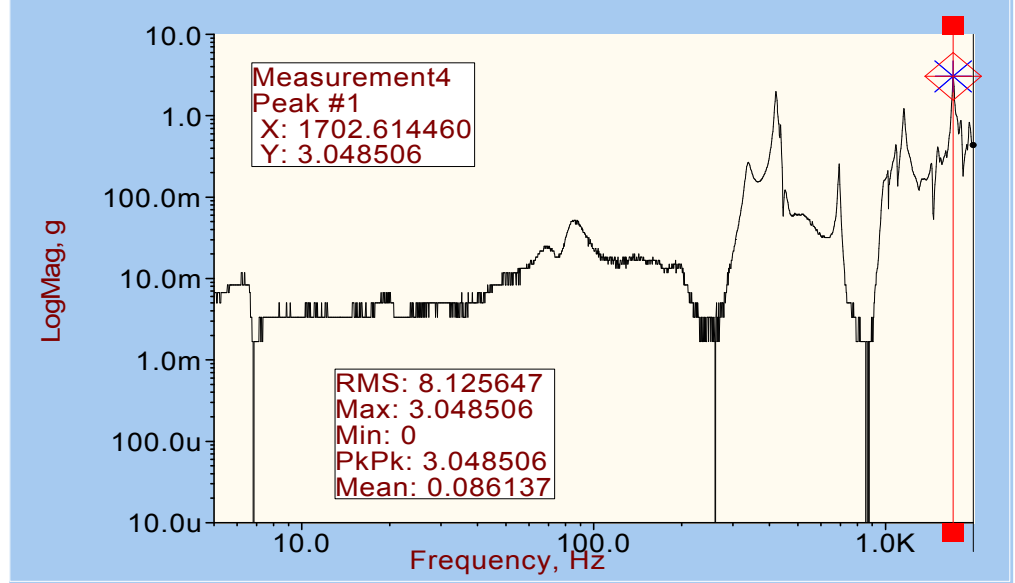
STRUCTURE TOP X AXIS



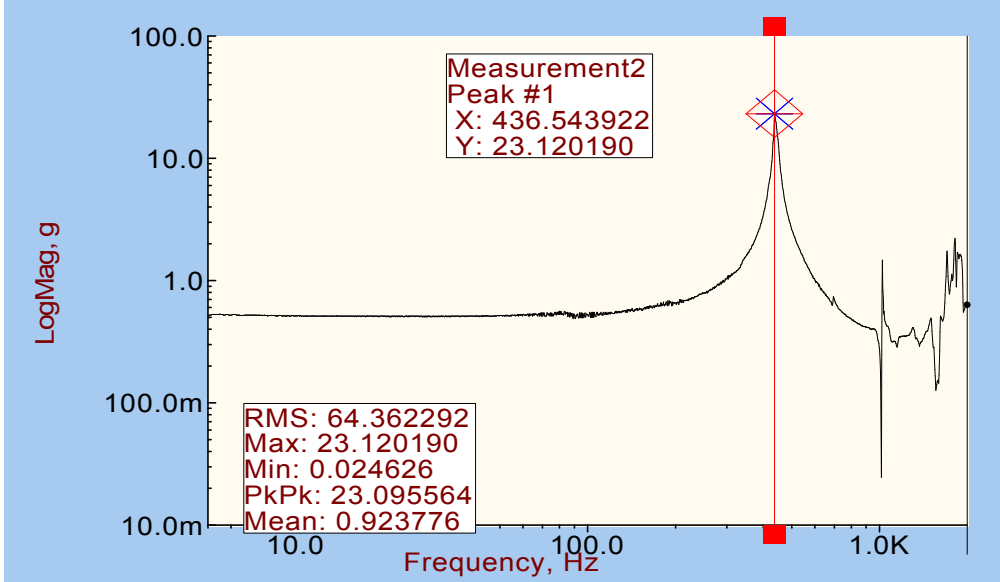
Control;AlarmLow;AlarmHigh;AbortLow;Abo



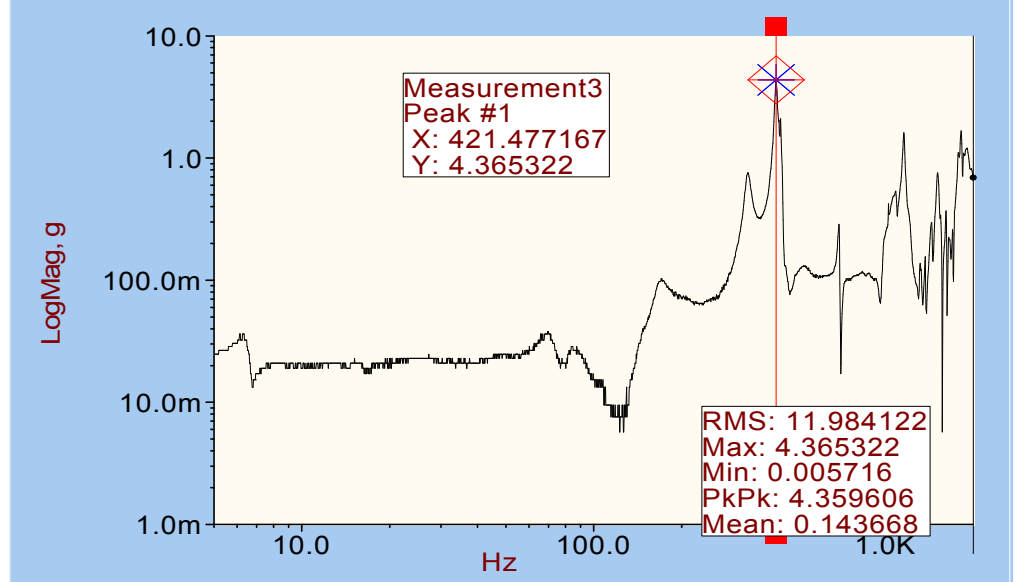
STRUCTURE TOP Y AXIS



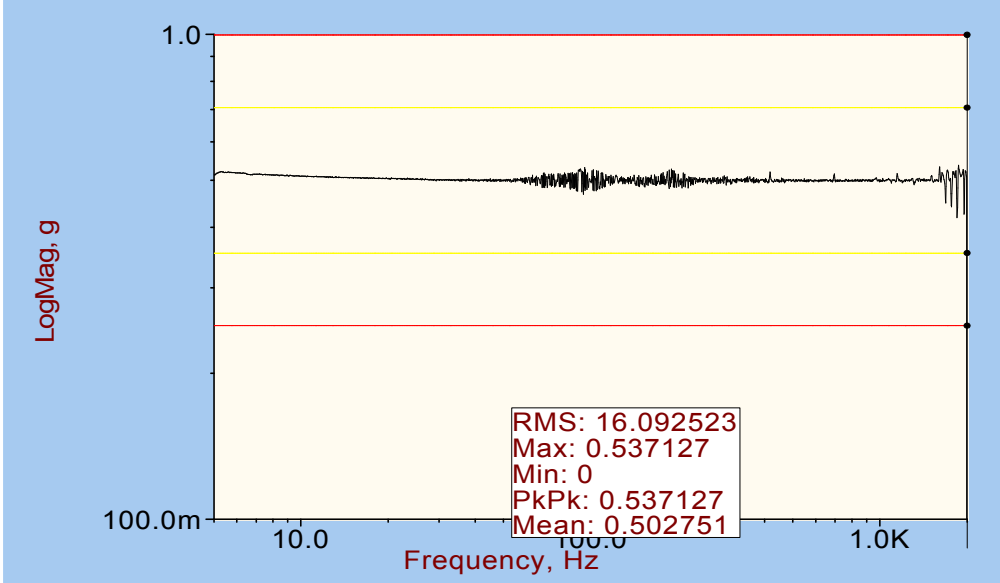
STRUCTURE TOP Z AXIS



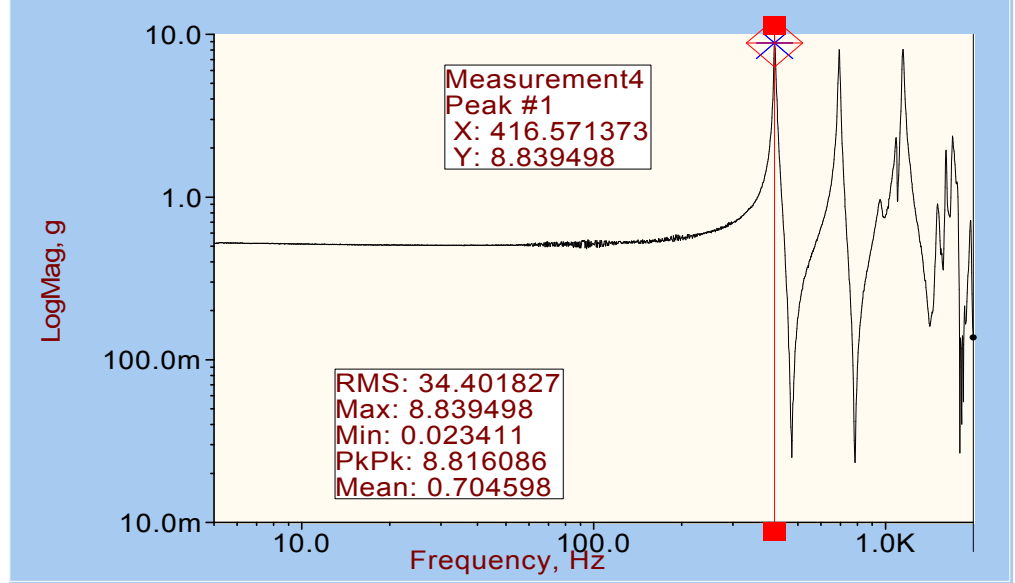
STRUCTURE TOP X AXIS



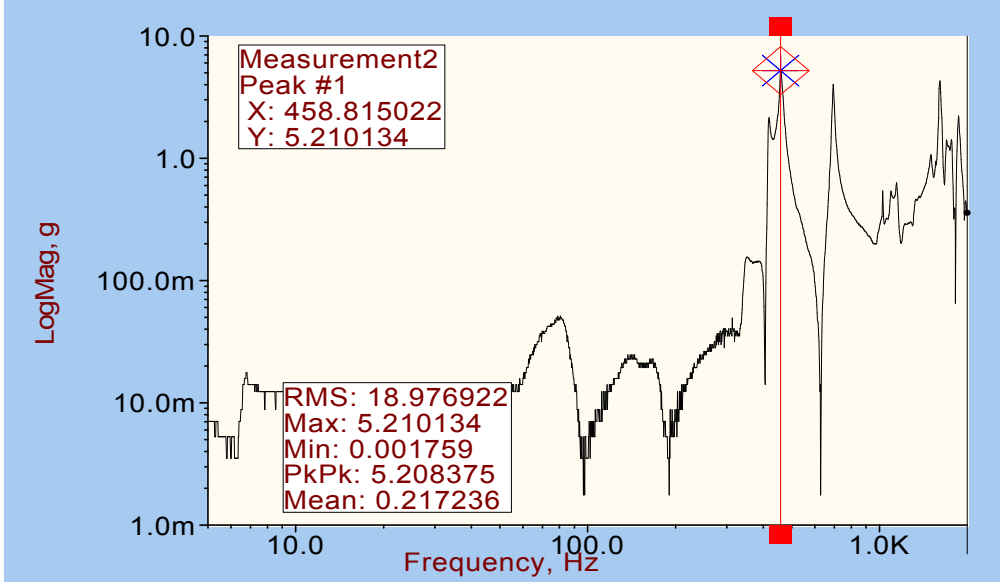
Control;AlarmLow;AlarmHigh;AbortLow;Abo



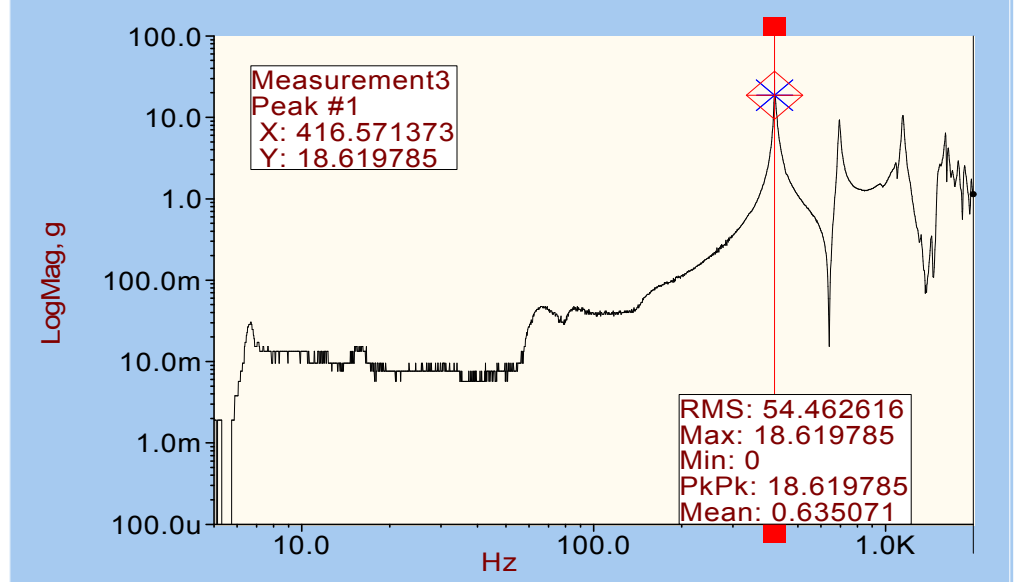
STRUCTURE TOP Y AXIS



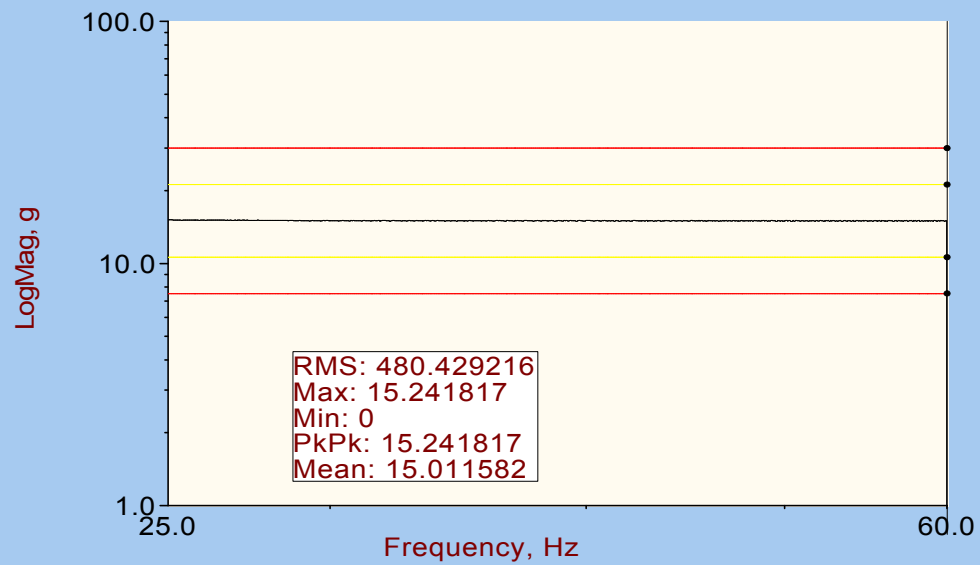
STRUCTURE TOP Z AXIS



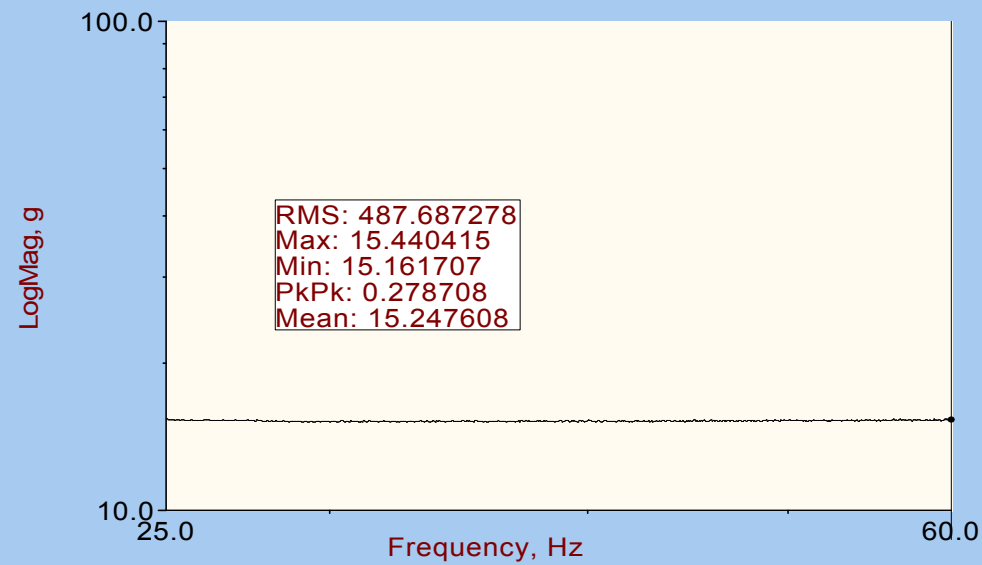
STRUCTURE TOP X AXIS



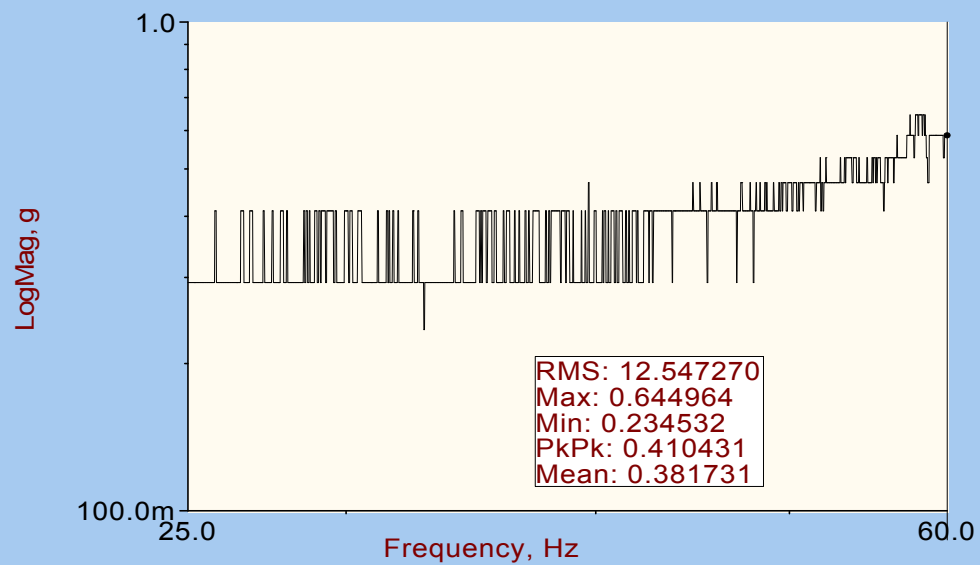
Control;AlarmLow;AlarmHigh;AbortLow;Abo



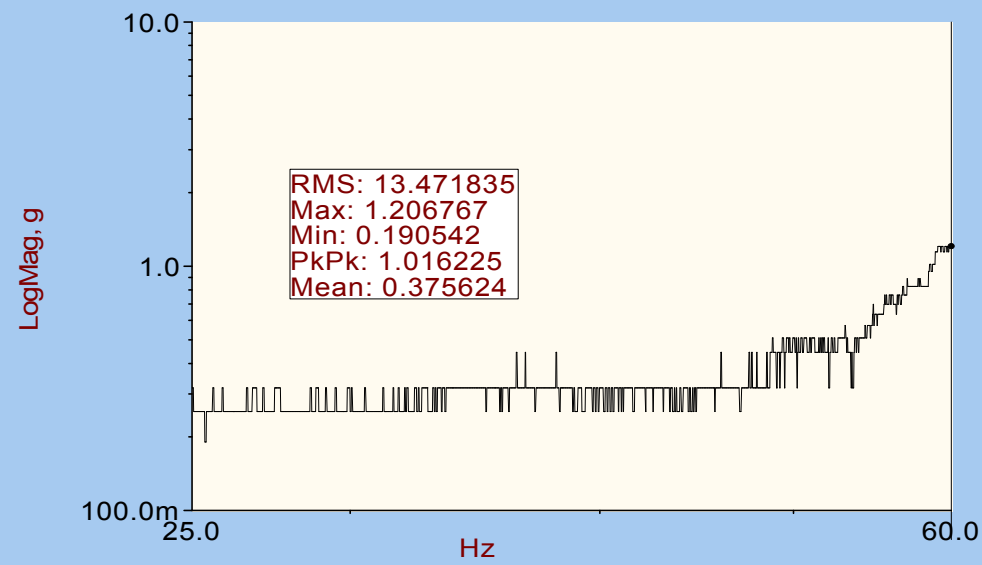
STRUCTURE TOP Y AXIS



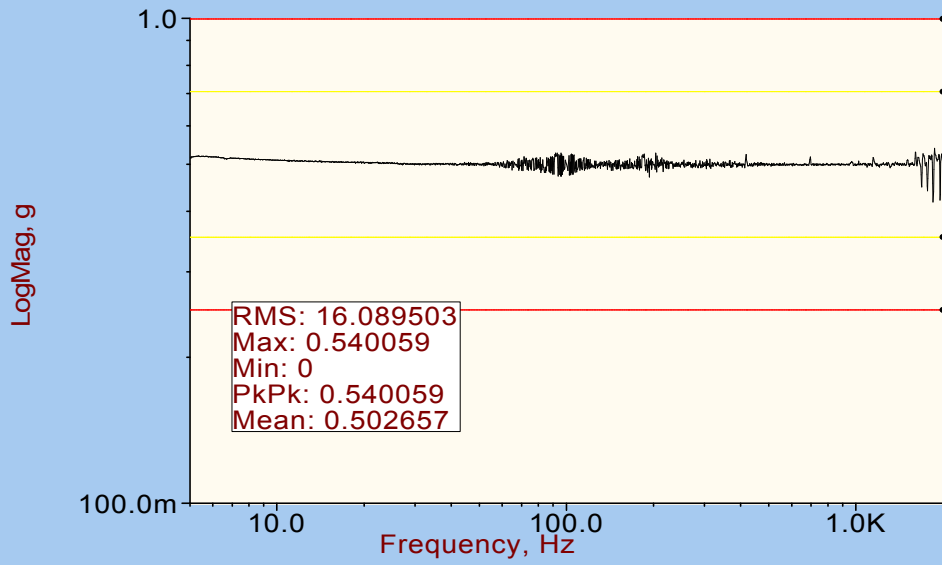
STRUCTURE TOP Z AXIS



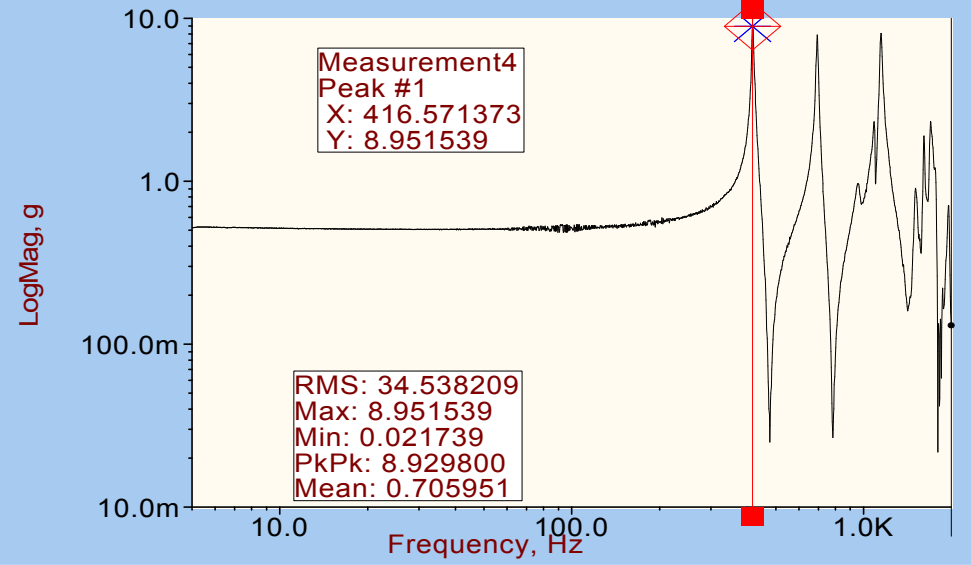
STRUCTURE TOP X AXIS



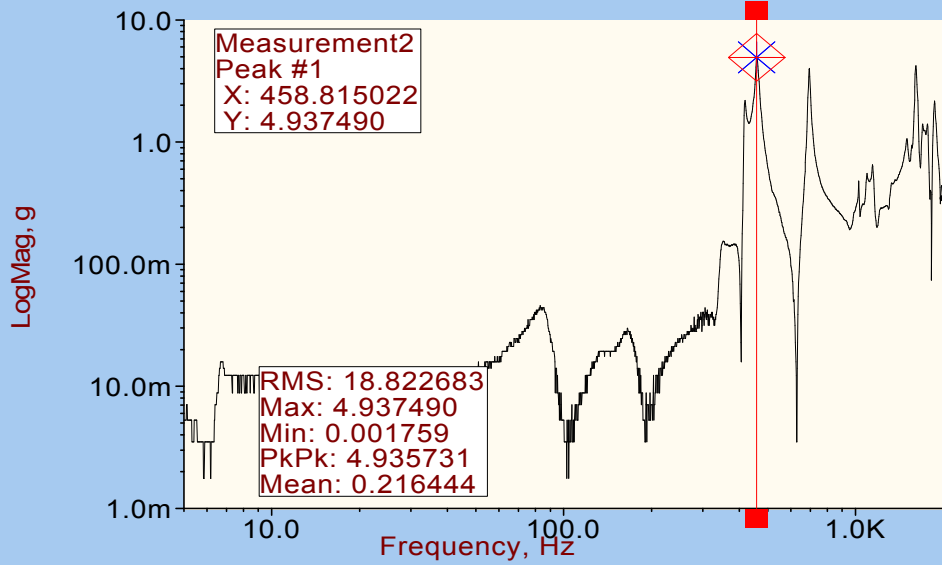
Control;AlarmLow;AlarmHigh;AbortLow;Abo



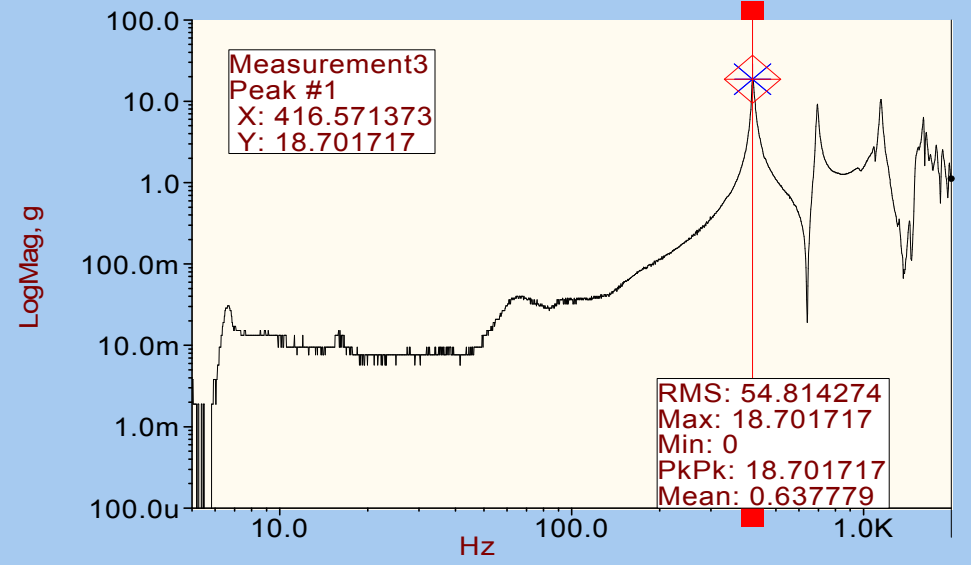
STRUCTURE TOP Y AXIS



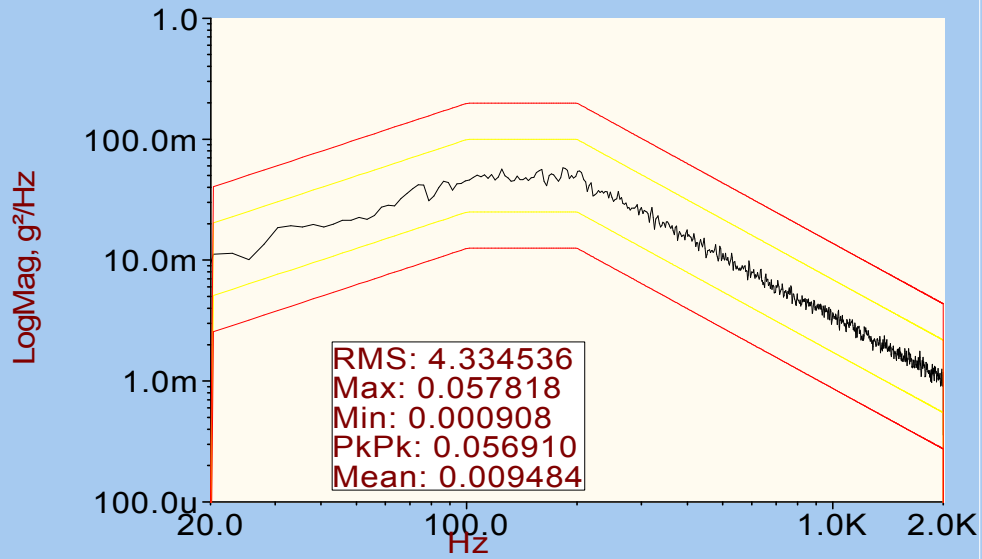
STRUCTURE TOP Z AXIS



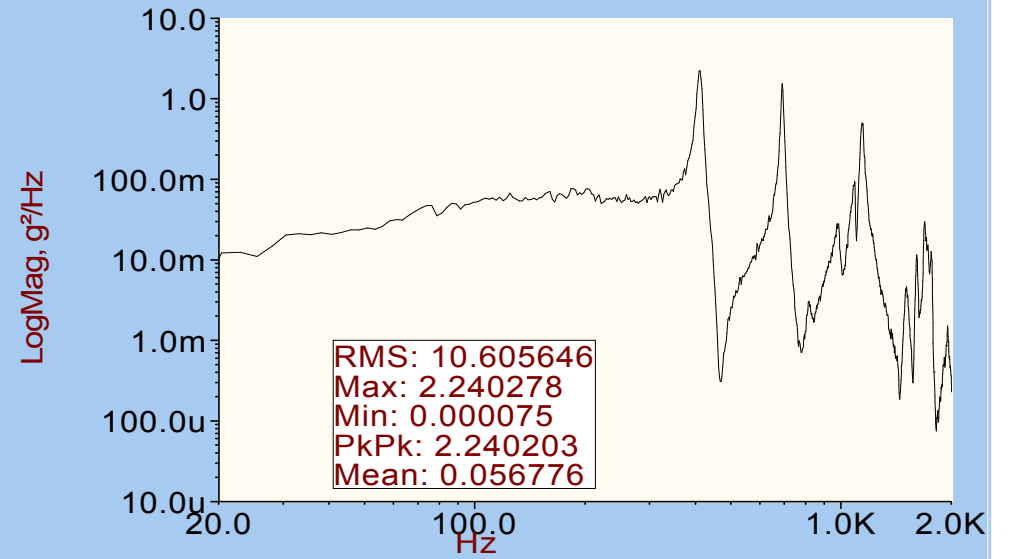
STRUCTURE TOP X AXIS



STRUCTURE TOP Y AXIS



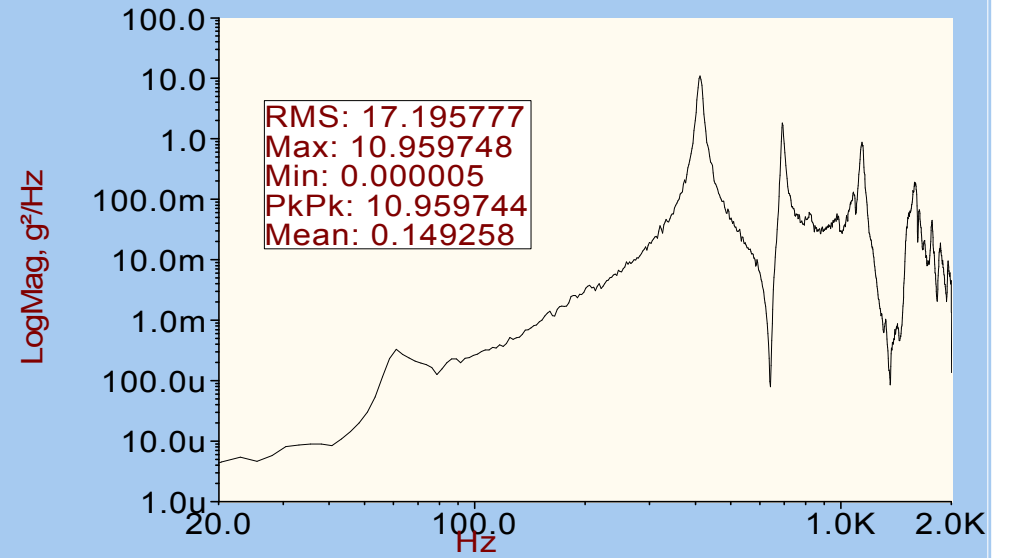
STRUCTURE TOP Y AXIS



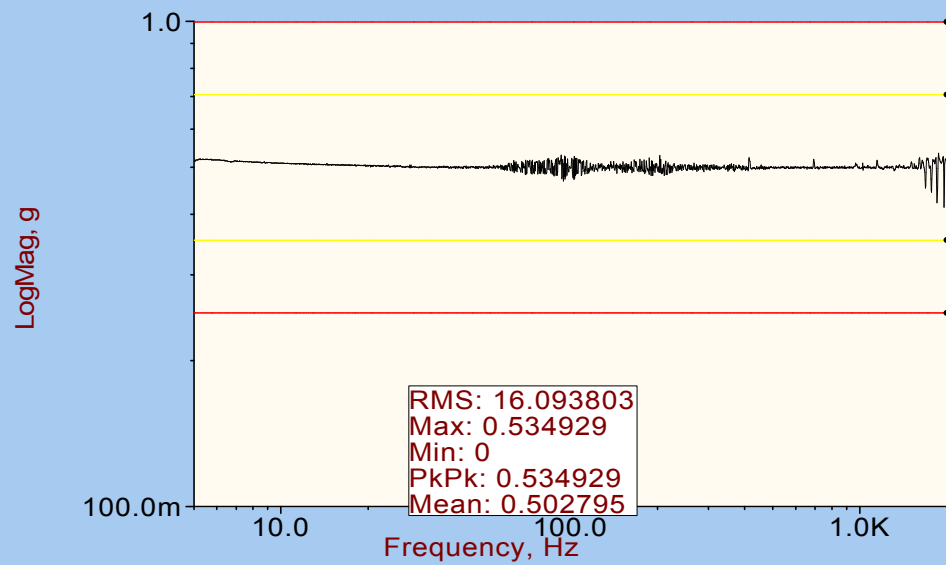
STRUCTURE TOP Z AXIS



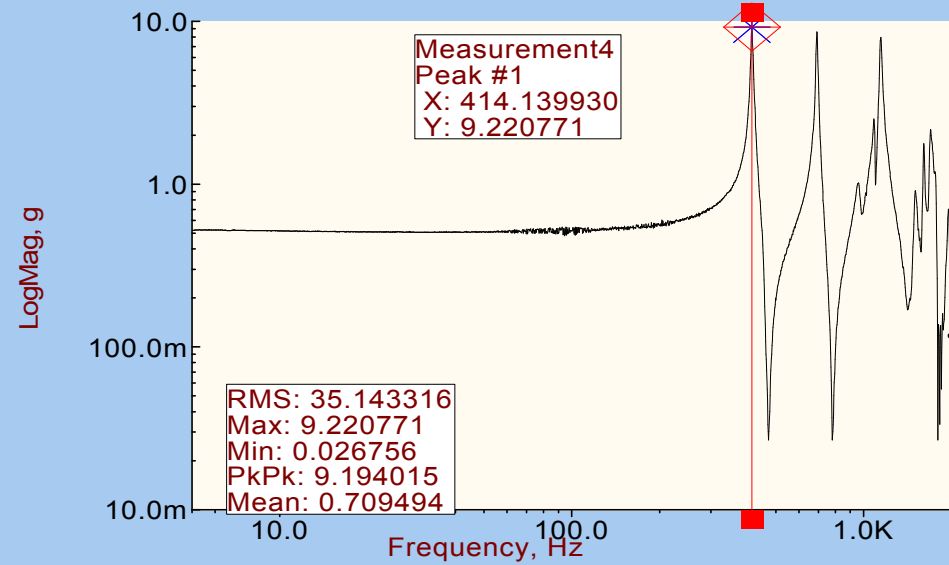
STRUCTURE TOP X AXIS



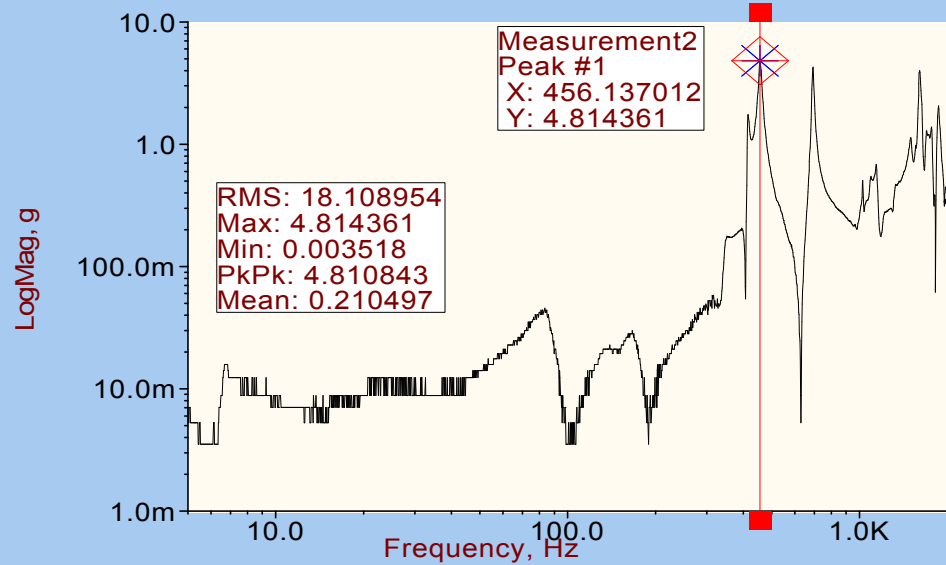
Control;AlarmLow;AlarmHigh;AbortLow;Abo



STRUCTURE TOP Y AXIS



STRUCTURE TOP Z AXIS



STRUCTURE TOP X AXIS

