



**SST DEPARTMENT**  
**VIBRATION TEST FACILITY**  
**REPORT REF: AIV-2000-113-VIB**  
**SMEI : CAMERA F.M. 3**

**RUTHERFORD APPLETON LABORATORY**  
**Vibration Facility**  
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Oxfordshire OX11 0QX

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## **1) TEST ITEM DESCRIPTION**

The test item consisted of the SMEI F.M. 3 Camera. It required testing in all three axes, X and Z-axes on the slip table and Y-axis on the head.

## **2) TEST SPECIFICATION**

The test Acceptance Specification levels were given in document ref: SMEI/UB/PLN/002 Issue 2 dated 15/12/2000. A low level sine survey was to be followed by a static load, a random and a final sine survey for all axes. One triaxial accelerometer and four single axis accelerometers were to be used for monitoring.

### **SINE SURVEY TEST**

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

### **STATIC LOAD**

Level:-22.5g

Frequency:- 35 Hertz

Duration:- Minimum 5 cycles (10 cycles used during testing)

### **RANDOM**

#### **ALL AXIS**

FREQUENCY (Hz)	TEST LEVEL (g <sup>2</sup> / Hz)
20	0.0330
40	0.0650
470	0.0650
2000	0.0036

Overall Test Level = 7.24 g rms. for 1 minute

### **3) PRE-TEST ACCELEROMETER VERIFICATION**

Control System:

The calibrated control accelerometer ( Endevco Type 7254A-100 (99.78mV/g) Serial No. 11923), was fastened onto the head of the LDS 954 shaker.

At a Frequency of 44.226 Hz with a displacement of 0.1 inches peak to peak, thus acceleration of 10 g peak the response of the auxiliary accelerometers were recorded. Also a 10 – 2000 Hz Sine Sweep run at 0.5 g at 2 octaves per minute was carried out to check the response of the accelerometers. Plots of the above runs are available for inspection, although not included in this report.

**Auxiliary Accelerometers: -**

Endevco Model 2258A-10 Triaxial  
Endevco Model 7250A-10 Single Axis

<b>CHANNEL NO.</b>	<b>SERIAL NUMBER</b>	<b>CALIBRATION</b>		<b>SIGNAL CONDITIONER</b>
		<b>mV/g</b>	<b>Date</b>	
2	11286 X	10.32	08/05/01	DYTRAN MODEL E4121 SERIAL No. 227
3	11286 Y	10.27	08/05/01	
4	11286 Z	10.35	08/05/01	
5	CN05	10.78	23/12/00	
6	CN10	10.39	24/12/00	
7	CY25	10.12	08/05/01	
8	CY28	9.60	08/05/01	

**Control Accelerometer :** Endevco Type 7254A-100 (99.78 mV/g) Serial No. 11923  
Next Calibration due: 8 May 2001

**Signal Conditioner:** Dytran model E4121 Serial No. 227  
Next Calibration due: 26 January 2001

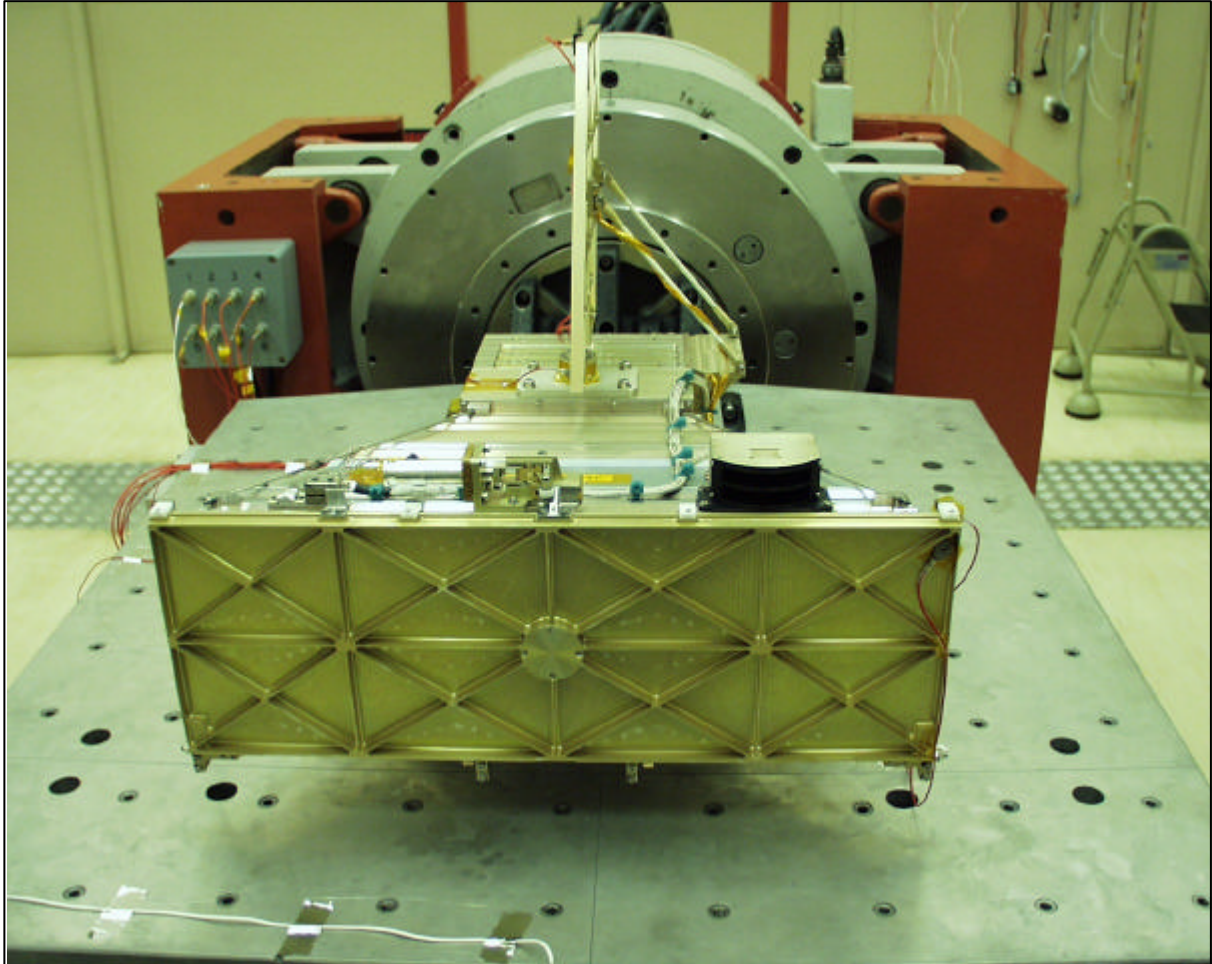
### **4) CLEANLINESS**

Approved cleanroom gloves to be worn when handling the Test Item.

## 5) FIXTURE DETAILS

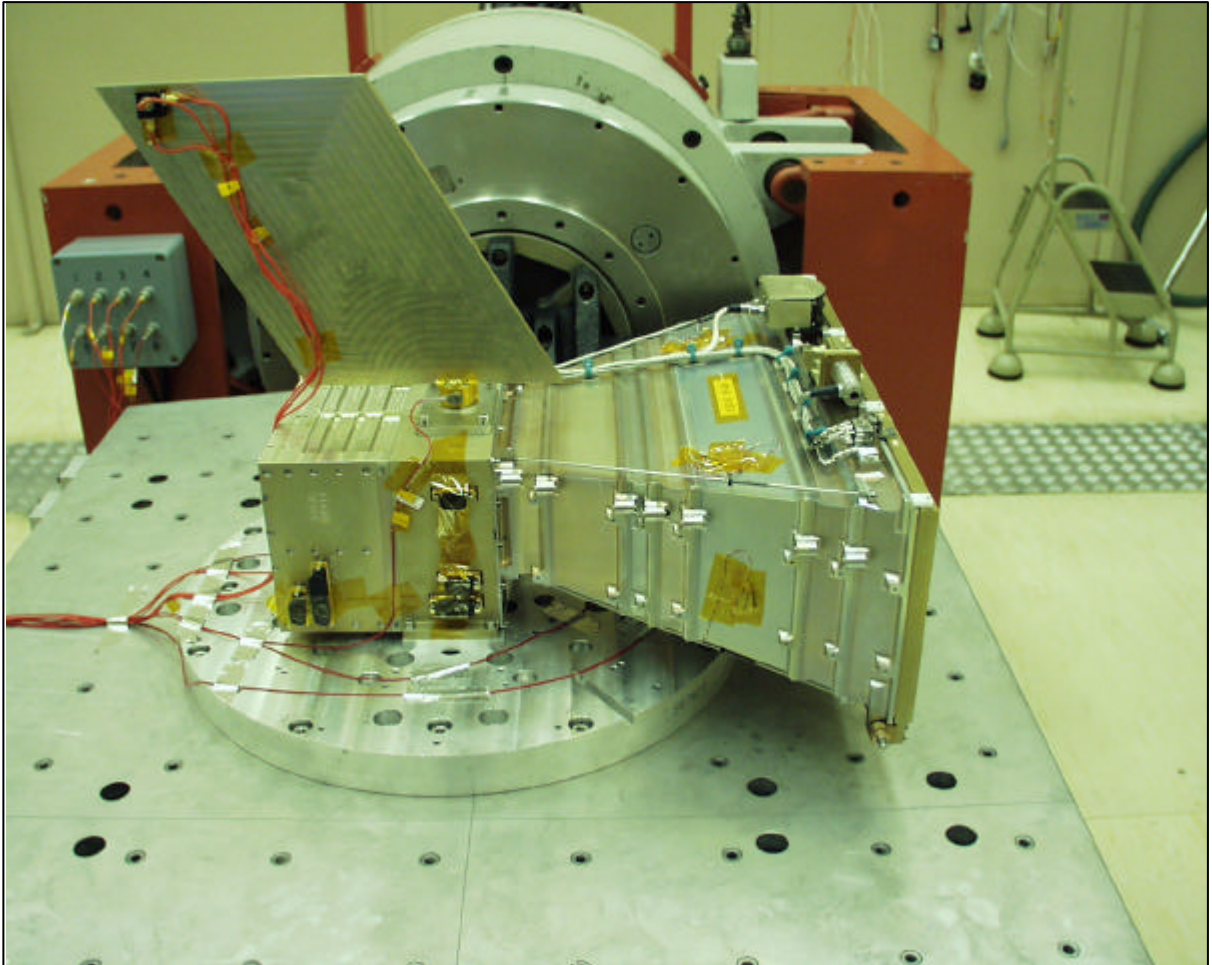
NOTE PHOTOGRAPHS FOR REFERENCE ONLY

Z AXIS VIBRATION TEST CONFIGURATION

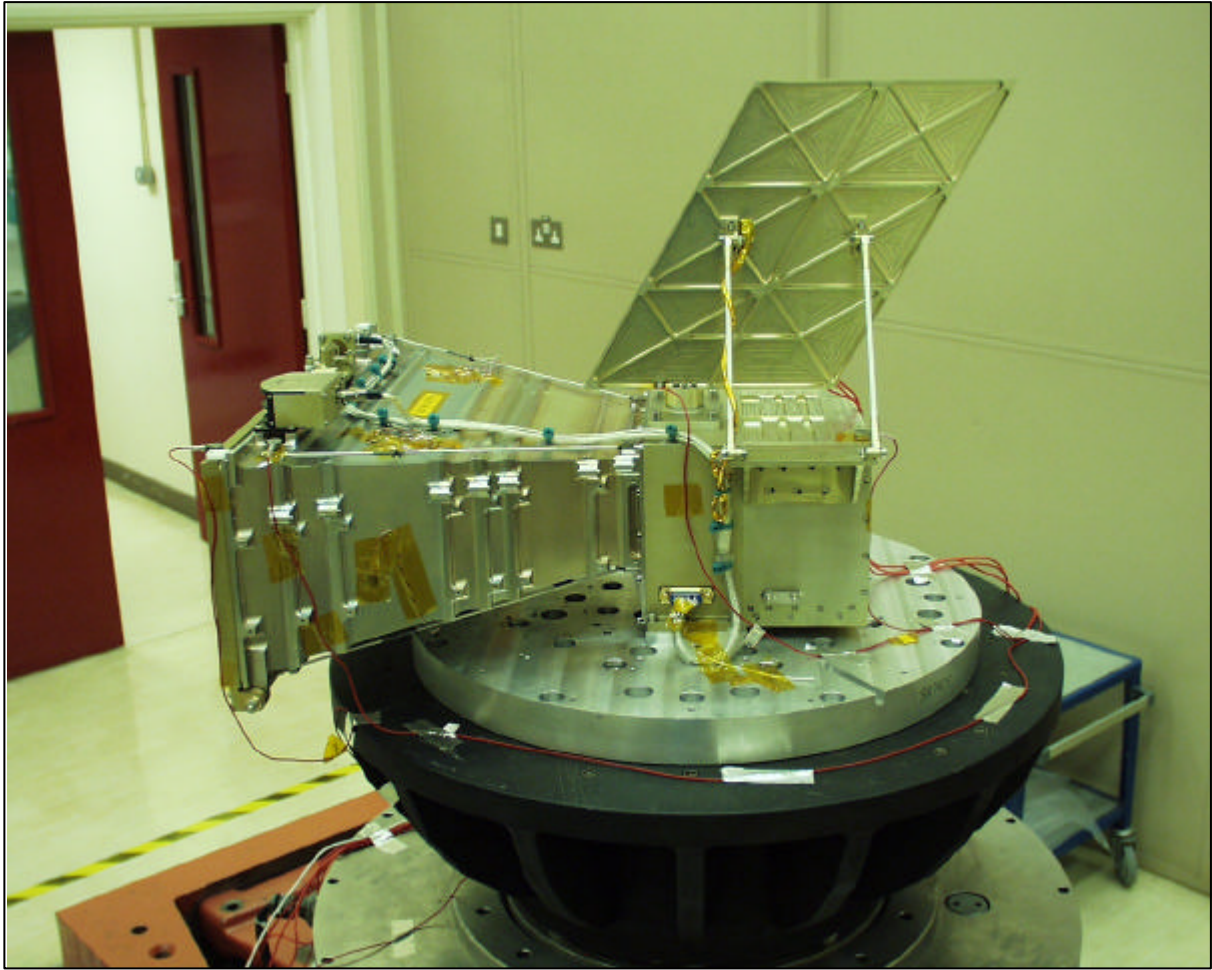


A view of the test item mounted on its vibration fixture on the slip table.

## X AXIS VIBRATION TEST CONFIGURATION



## Y AXIS VIBRATION TEST CONFIGURATION



## **6) TEST SUMMARY**

Testing Date: 5 January 2001

Observers: Chris Eyles & John Bryant.

Organisation : Birmingham University  
Astrophysics and Space Research Group  
Edgbaston  
Birmingham B15 2TT

### **CHANNEL ALLOCATION:**

#### **CONTROL:-**

<b>Channel No.</b>	<b>Accelerometer Type/Serial No.</b>	<b>Testing Axis</b>	<b>Mounting Position</b>
1	Endevco 11923	In Axis	Fixture

#### **MONITORING:-**

<b>Channel No.</b>	<b>Accelerometer Type/Serial No.</b>	<b>Testing Axis</b>	<b>Mounting Position</b>
2	Endevco 11286-X	<b>Y</b>	Top corner radiator
3	Endevco 11286-Y	<b>Z</b>	Top corner radiator
4	Endevco 11286-Z	<b>X</b>	Top corner radiator
5	Endevco CN05	<b>IN AXIS</b>	Top end of cold finger
6	Endevco CN10	<b>IN AXIS</b>	Top corner baffles
7	Endevco CY25	<b>IN AXIS</b>	Rear end baffles
8	Endevco CY28	<b>IN AXIS</b>	Rear top corner electronics

#### **NOTE**

During the random shake in the Z-axis (see fig 7b) the accelerometer on the top corner of the baffles came adrift from the camera. This was reattached for all subsequent runs.

## **ACCELEROMETER TEST PLOTS**

### **VIBRATION TESTS in the Y-axis**

RUN 00001 SINE SURVEY *FIG 1 a & b*

RUN 00001 STATIC LOAD *FIG 2 a & b*

RUN 00001 RANDOM *FIG 3 a & b*

RUN 00002 POST RANDOM SINE SURVEY *FIG 4 a & b*

### **VIBRATION TESTS in the Z-axis**

RUN 00003 SINE SURVEY *FIG 5 a & b*

RUN 00002 STATIC LOAD *FIG 6 a & b*

RUN 00002 RANDOM *FIG 7 a & b*

RUN 00004 POST RANDOM SINE SURVEY *FIG 8 a & b*

### **VIBRATION TESTS in the X-axis**

RUN 00005 SINE SURVEY *FIG 9 a & b*

RUN 00003 STATIC LOAD *FIG 10 a & b*

RUN 00003 RANDOM *FIG 11 a & b*

RUN 00006 POST RANDOM SINE SURVEY *FIG 12 a & b*

## **7) CONCLUSION**

The test item was subjected to the levels of vibration as detailed by document ref. SMEI/UB/PLN/002 Issue 2 dated 15/12/2000. No visible damage occurred during testing.

### **FACILITY OPERATOR: -**

Signature.....

Date.....

2001

David RIPPINGTON

### **FACILITY MANAGER:-**

Signature.....

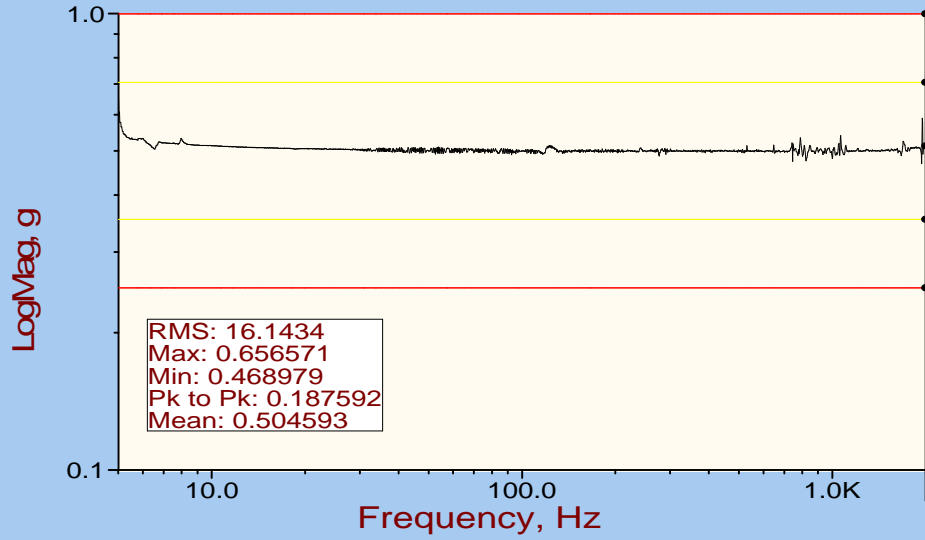
Date.....

2001

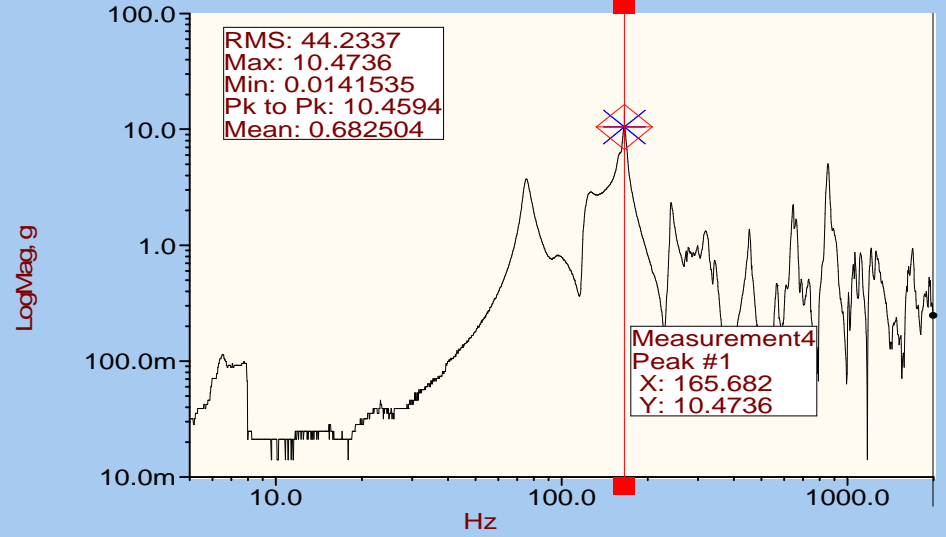
Graham TOPLIS

## **ANNEX:A ACCELEROMETER PLOTS**

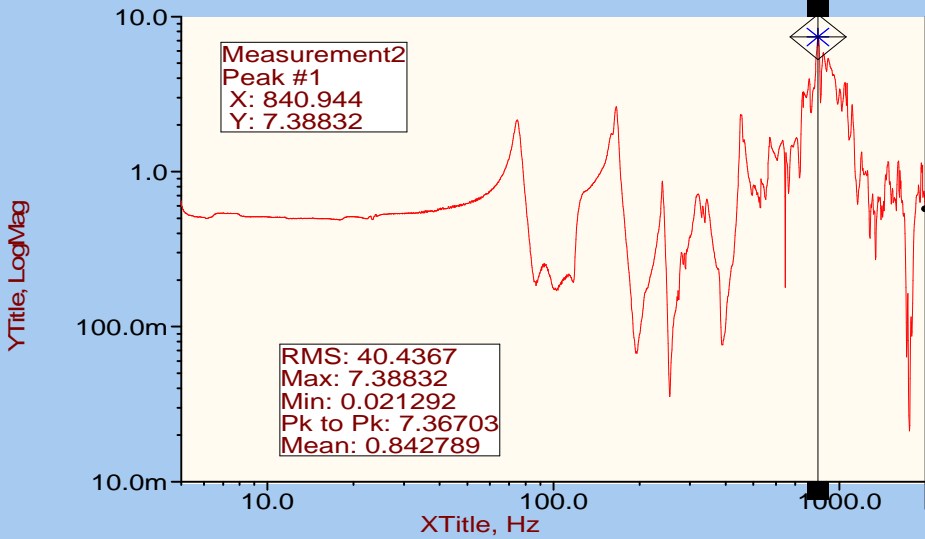
### Control;AlarmLow;AlarmHigh;AbortLow;Abo



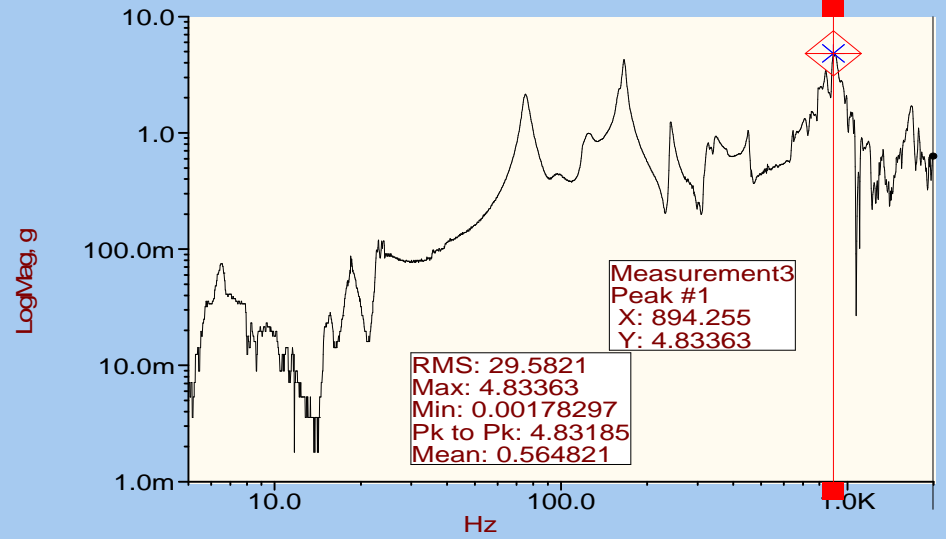
### TOP CORNER RADIATOR X AXIS



### TOP CORNER RADIATOR Y AXIS



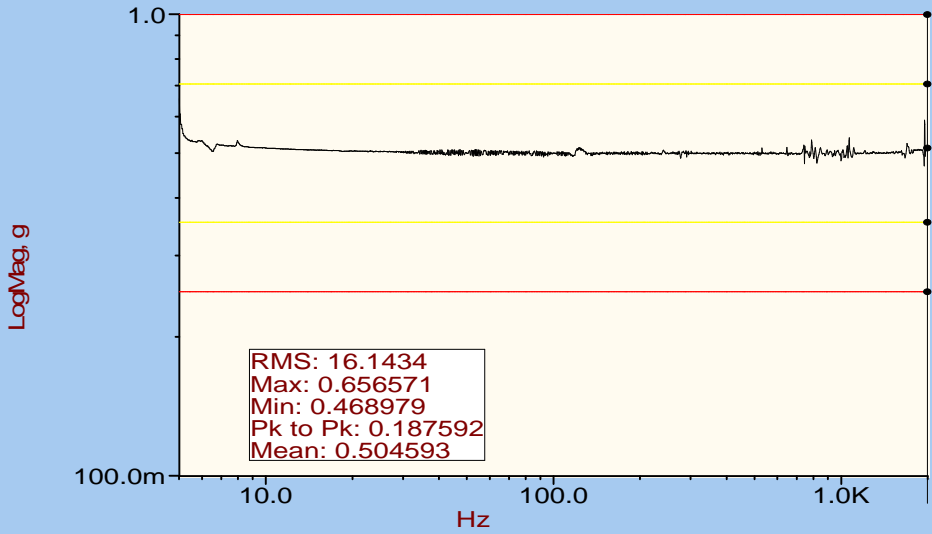
### TOP CORNER RADIATOR Z AXIS



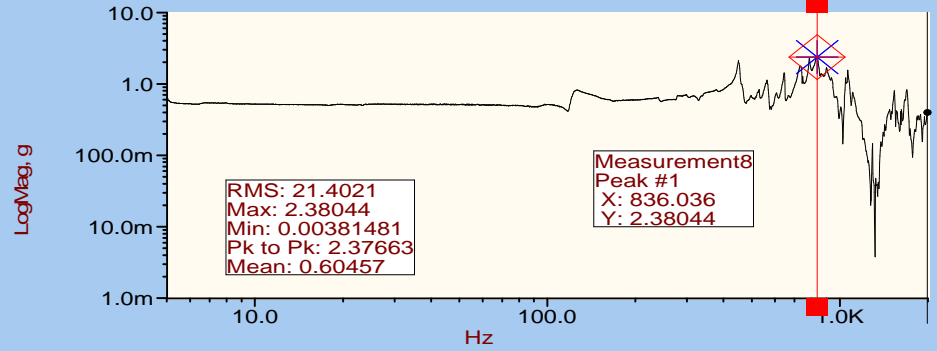
SMEI FM3 CAMERA SINE SURVEY  
RUN 00001  
Y AXIS  
14:08:36 04/01/2001

FIG 1a

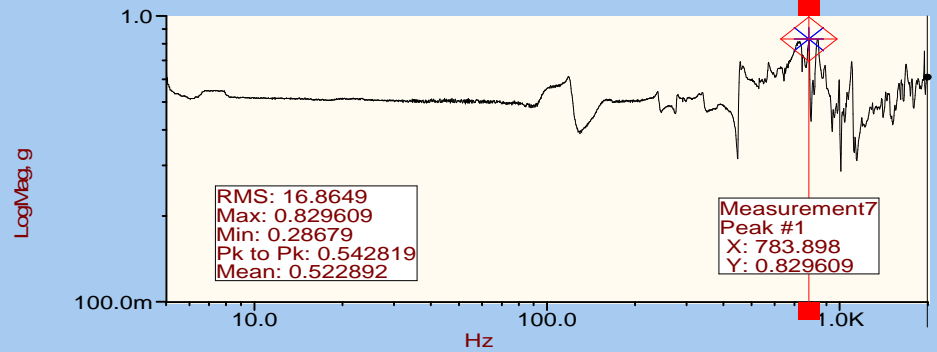
### Control;AlarmLow;AlarmHigh;AbortLow;Abo



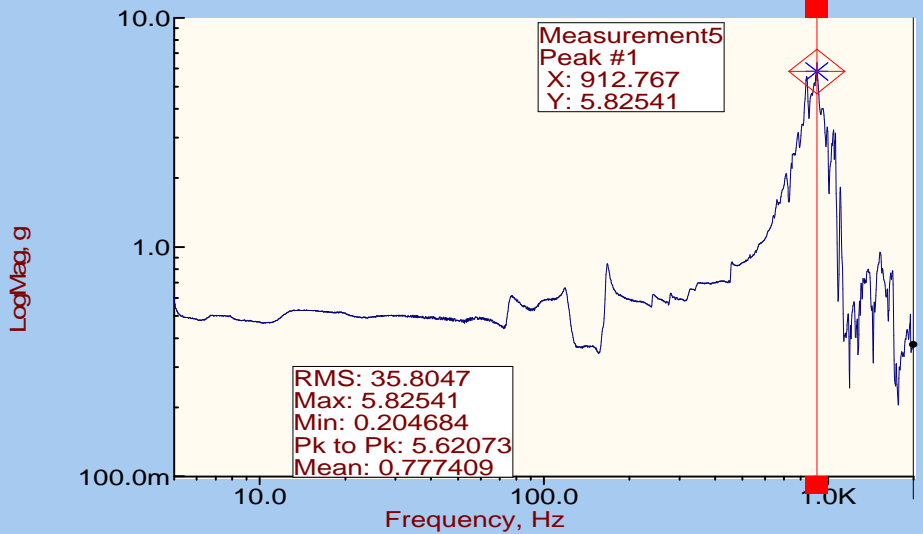
### REAR TOP CORNER E BOX Y AXIS



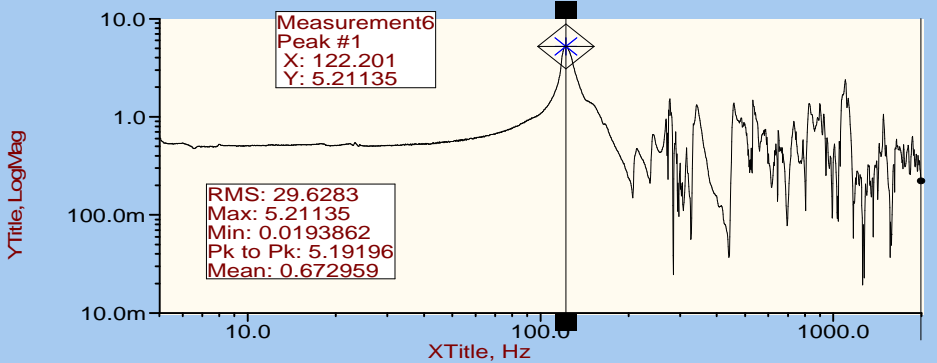
### REAR END Baffle Y AXIS



### TOP END COLD FINGER Y AXIS



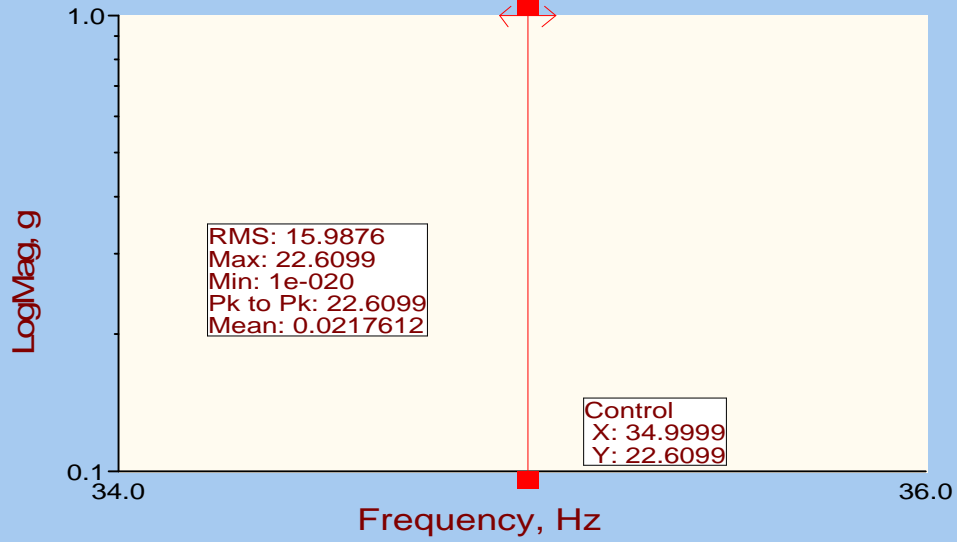
### TOP CORNER Baffle Y AXIS



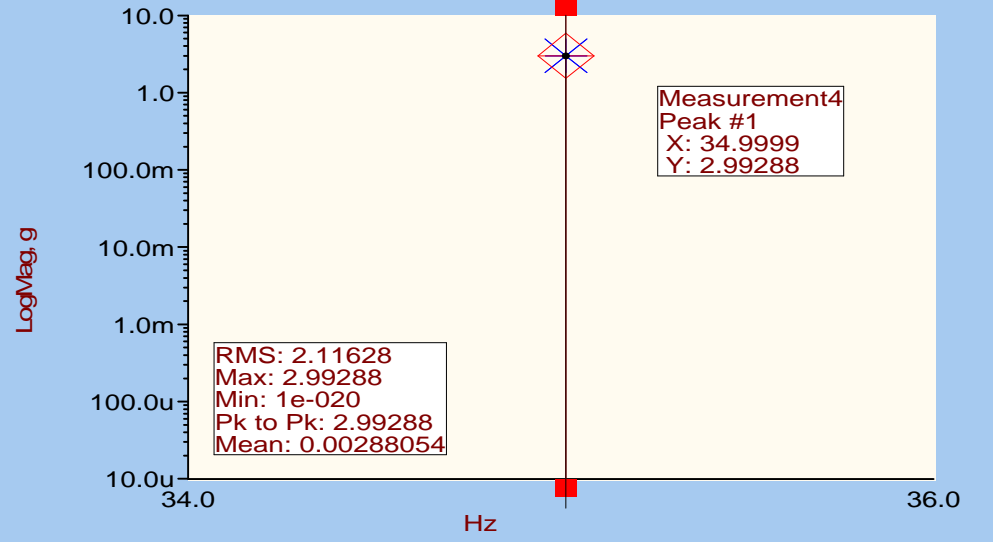
SMEI FM3 CAMERA SINE SURVEY  
 RUN 00001  
 Y AXIS  
 14:08:36 04/01/2001

FIG 1b

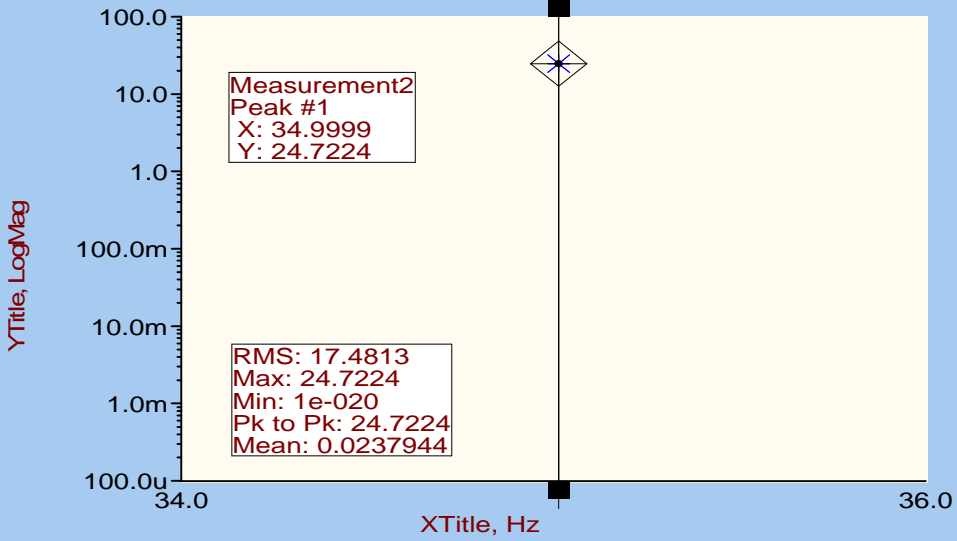
### Control



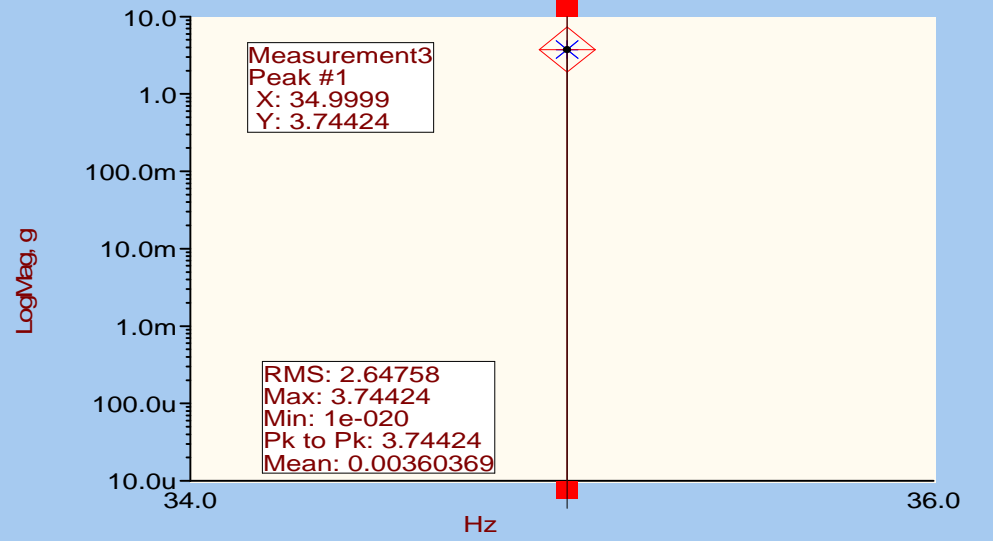
### TOP CORNER RADIATOR X AXIS



### TOP CORNER RADIATOR Y AXIS



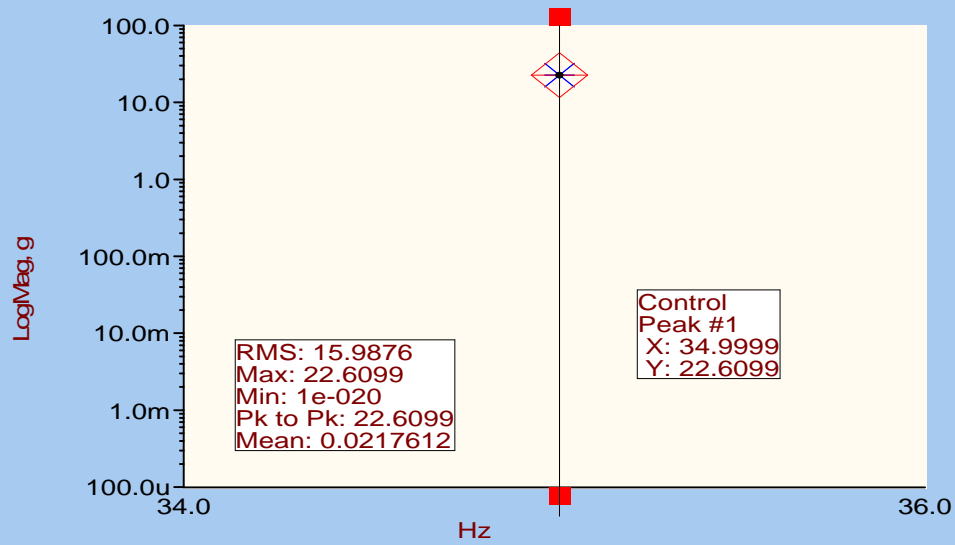
### TOP CORNER RADIATOR Z AXIS



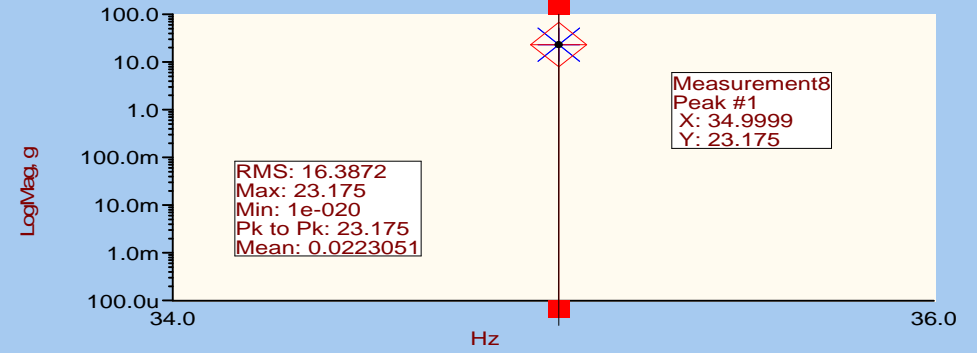
SMEI FM3 CAMERA STATIC LOAD  
RUN 00001  
Y AXIS  
14:14:47 04/01/2001

FIG 2a

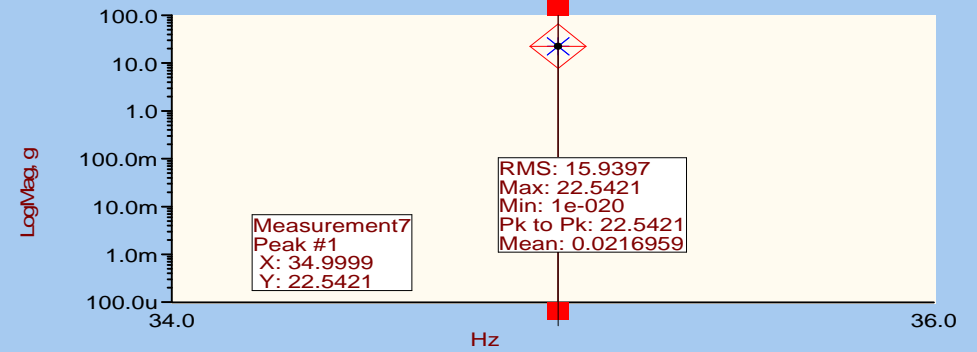
### Control



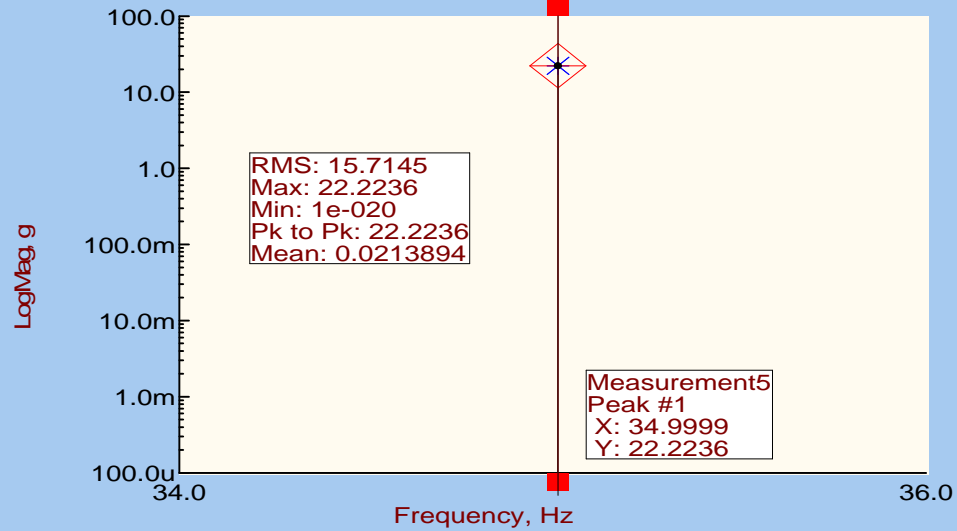
### REAR TOP CORNER E BOX Y AXIS



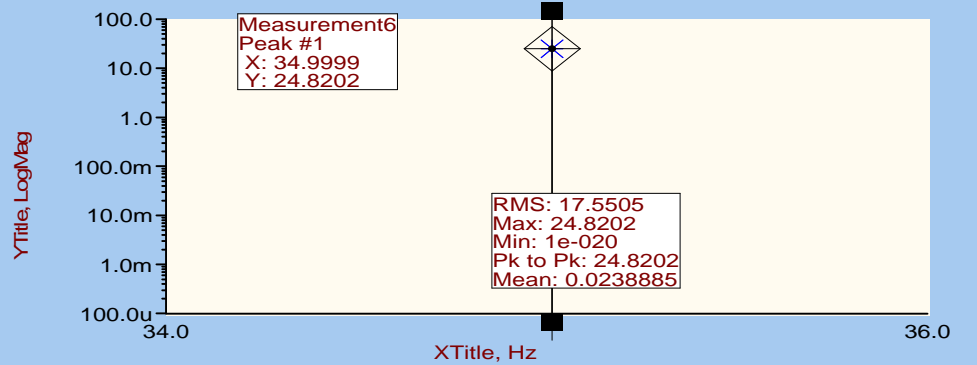
### REAR END Baffle Y AXIS



### TOP END COLD FINGER Y AXIS



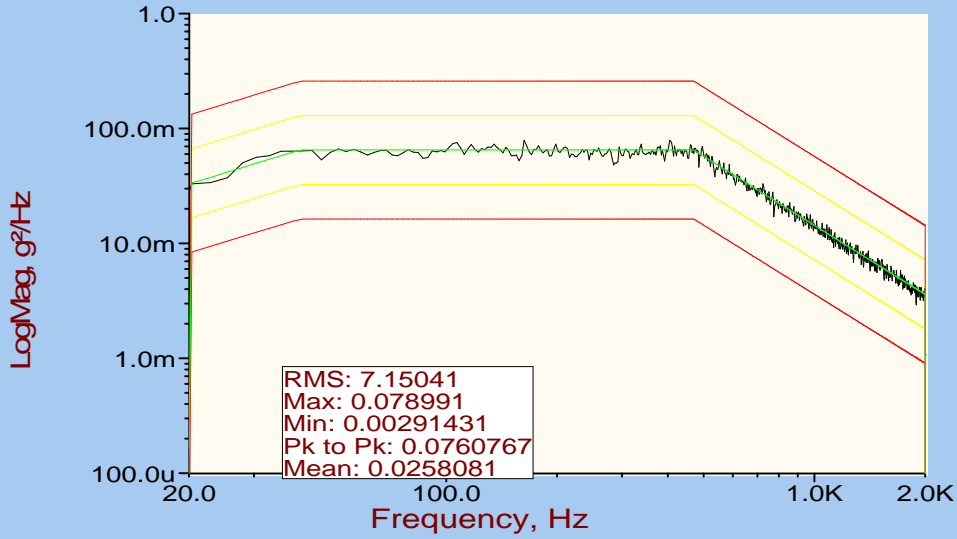
### TOP CORNER Baffles Y AXIS



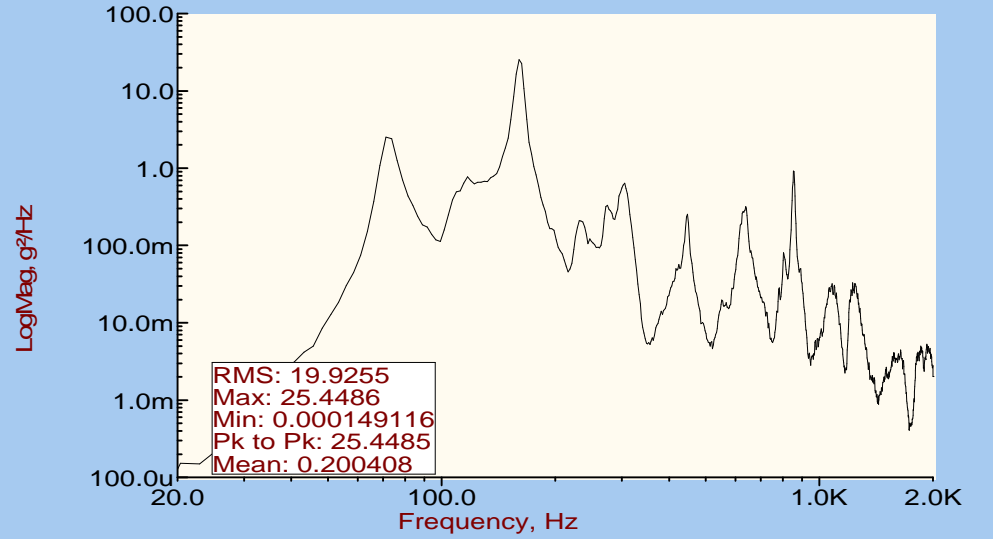
SMEI FM3 CAMERA STATIC LOAD  
RUN 00001  
Y AXIS  
14:14:47 04/01/2001

FIG 2b

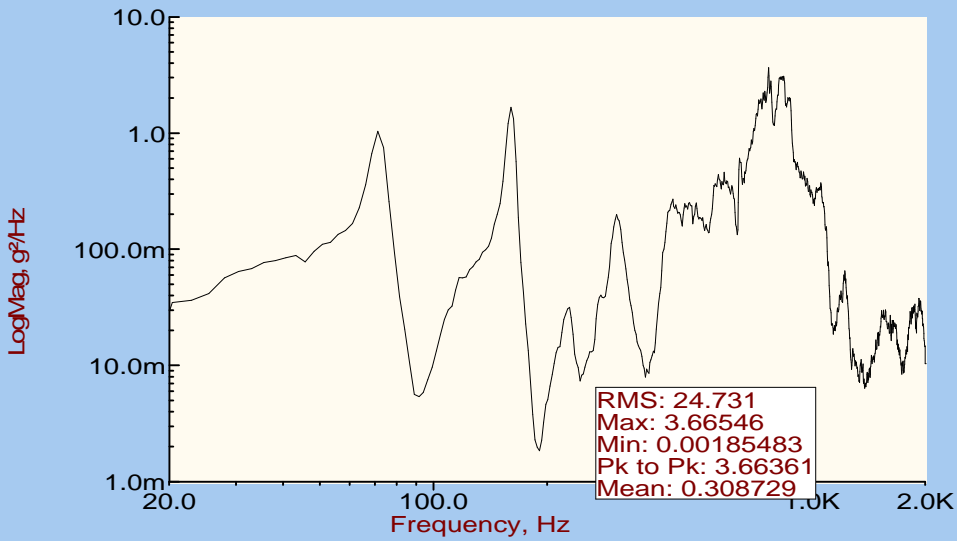
### Control;AlarmLow;AlarmHigh;AbortLow;Abo



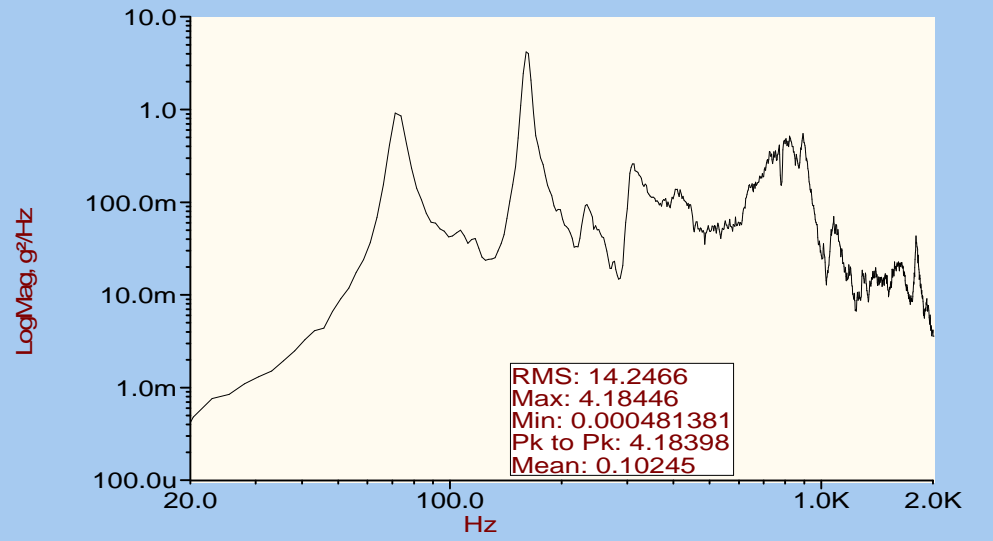
### TOP CORNER RADIATOR X AXIS



### TOP CORNER RADIATOR Y AXIS



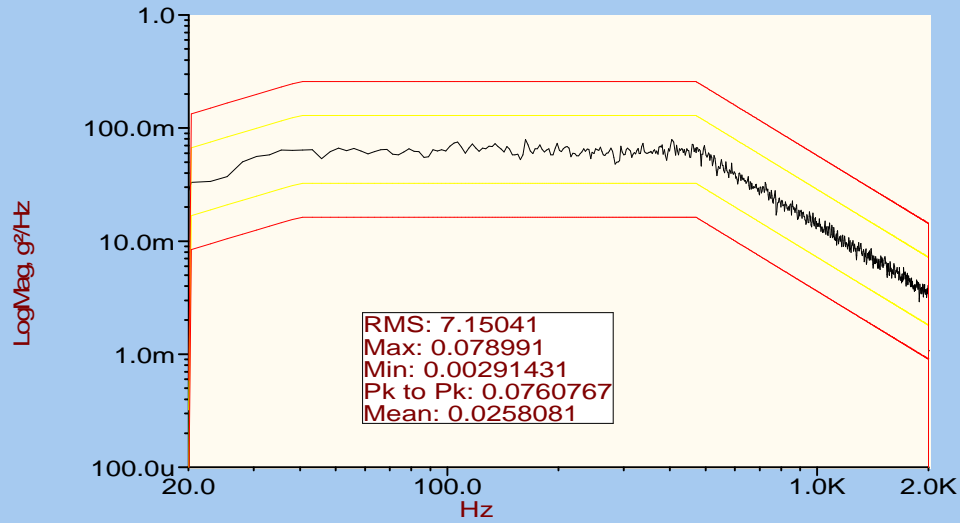
### TOP CORNER RADIATOR Z AXIS



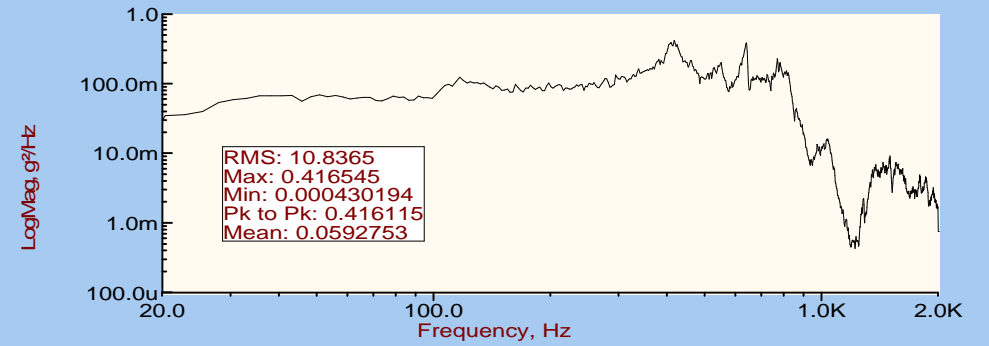
SMEI FM3 CAMERA RANDOM  
RUN 00001  
Y AXIS  
14:16:27 04/01/2001

FIG 3a

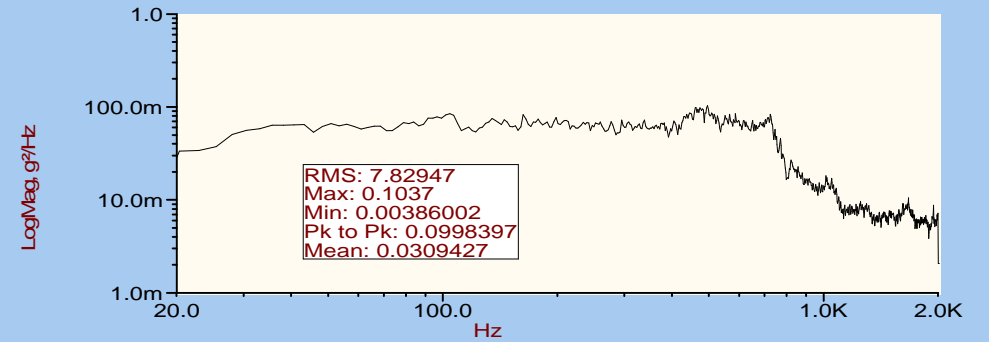
### Control;AlarmLow;AlarmHigh;AbortLow;Abo



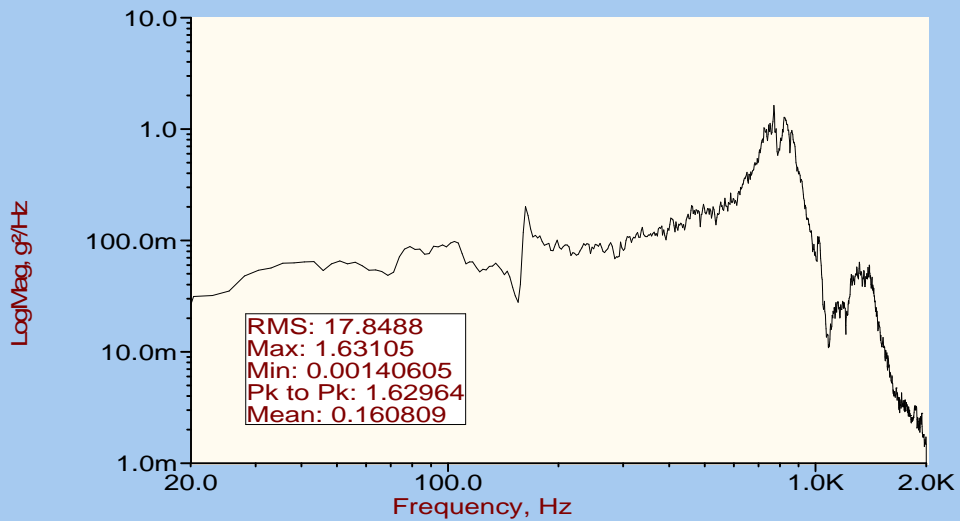
### REAR TOP CORNER E BOX Y AXIS



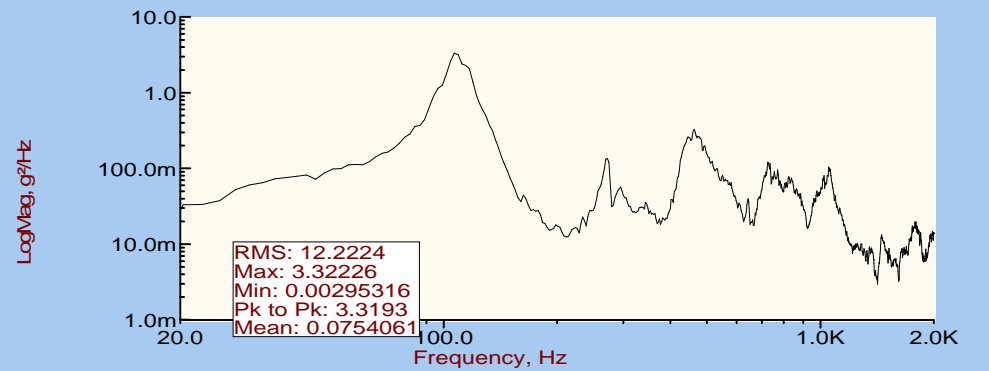
### REAR END Baffle Y AXIS



### TOP END COLD FINGER Y AXIS



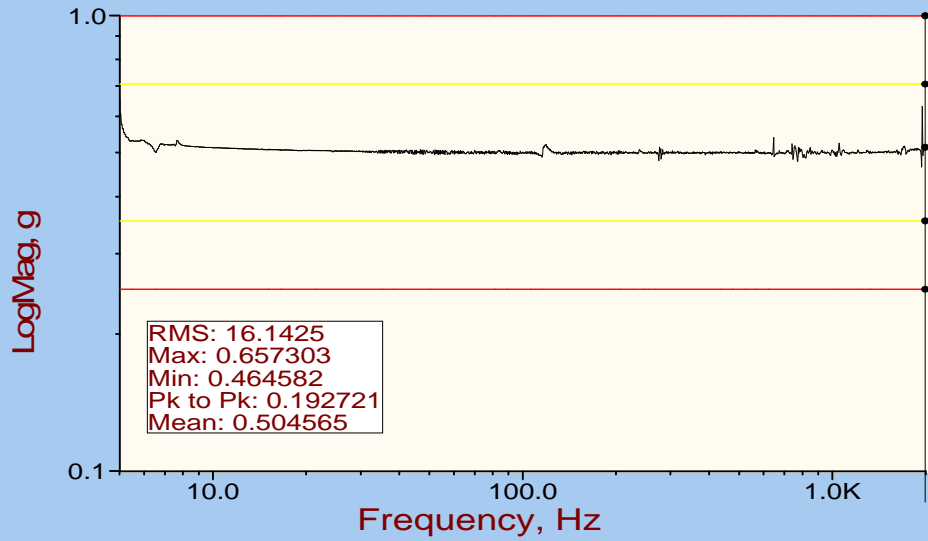
### TOP CORNER Baffles Y AXIS



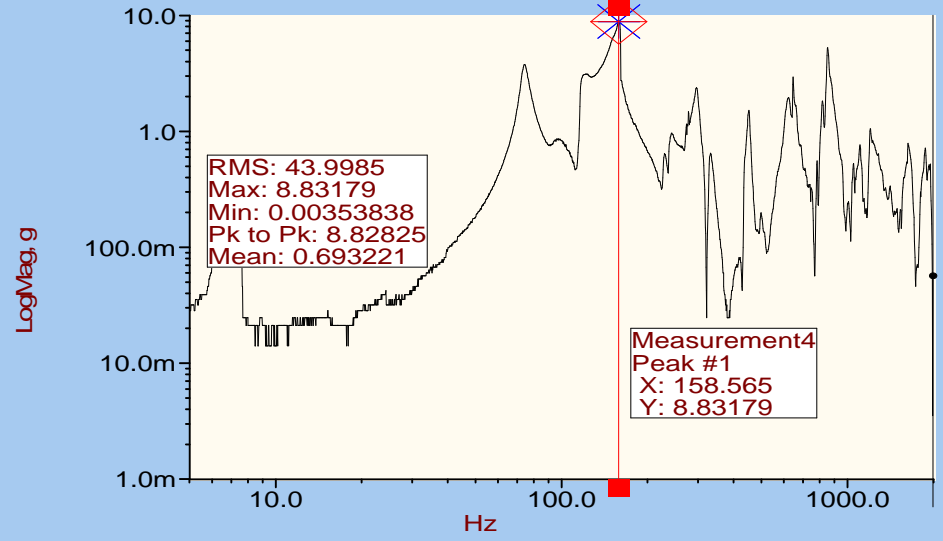
SMEI FM3 CAMERA RANDOM  
RUN 00001  
Y AXIS  
14:16:27 04/01/2001

FIG 3b

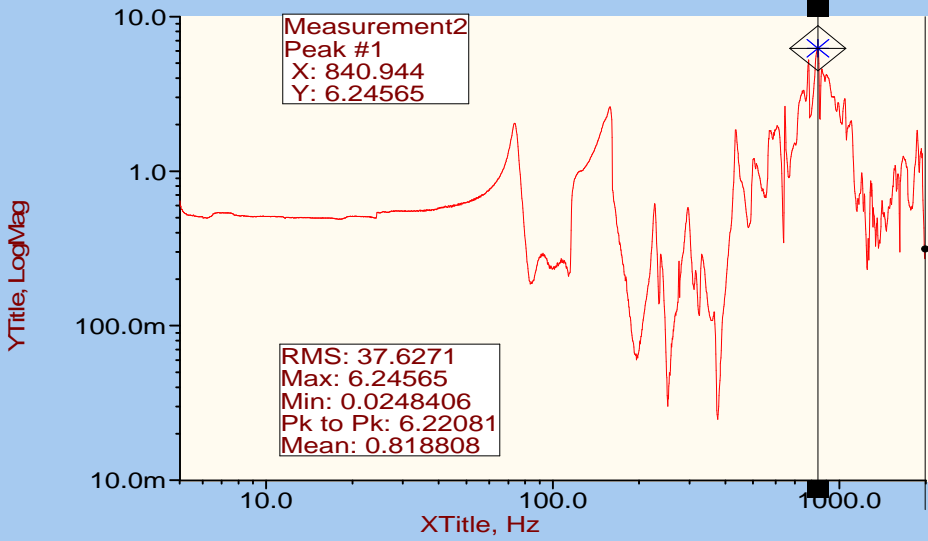
### Control;AlarmLow;AlarmHigh;AbortLow;Abo



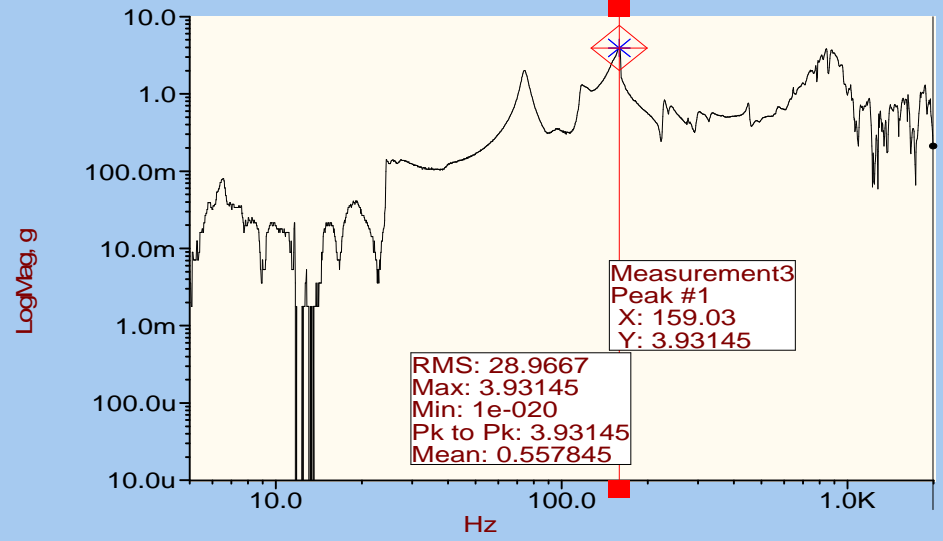
### TOP CORNER RADIATOR X AXIS



### TOP CORNER RADIATOR Y AXIS



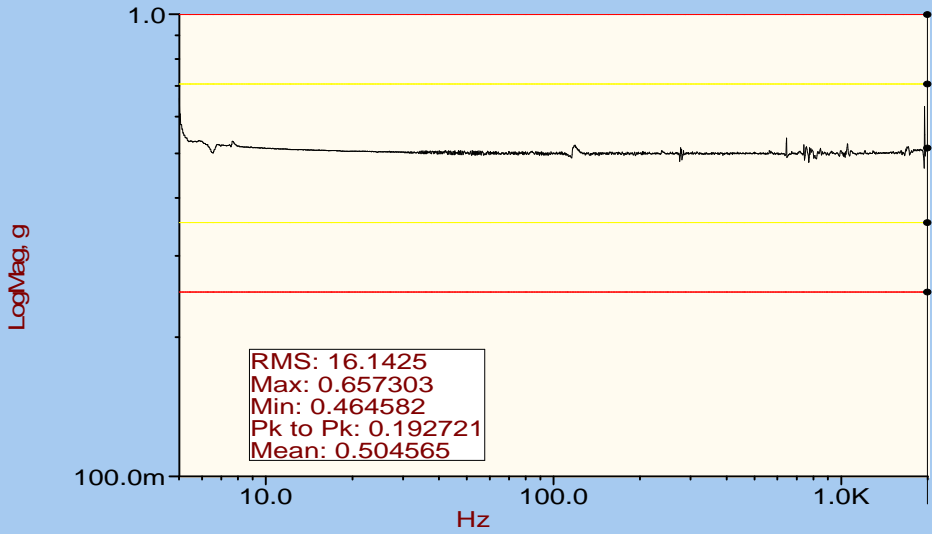
### TOP CORNER RADIATOR Z AXIS



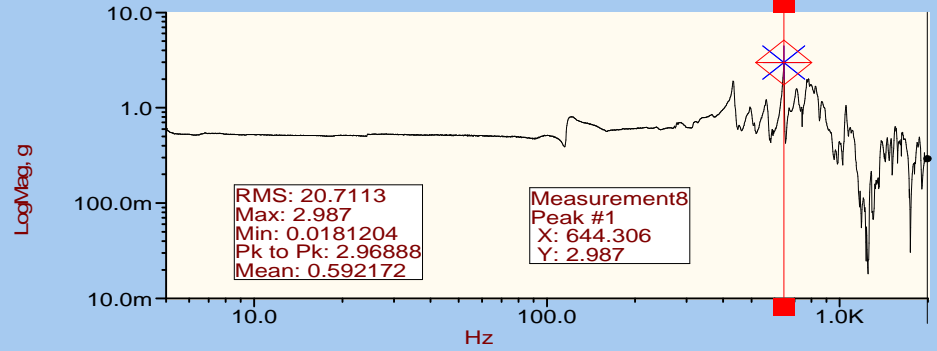
SMEI FM3 CAMERA POST RANDOM SINE SURVEY  
 RUN 00002  
 Y AXIS  
 14:19:44 04/01/2001

FIG 4a

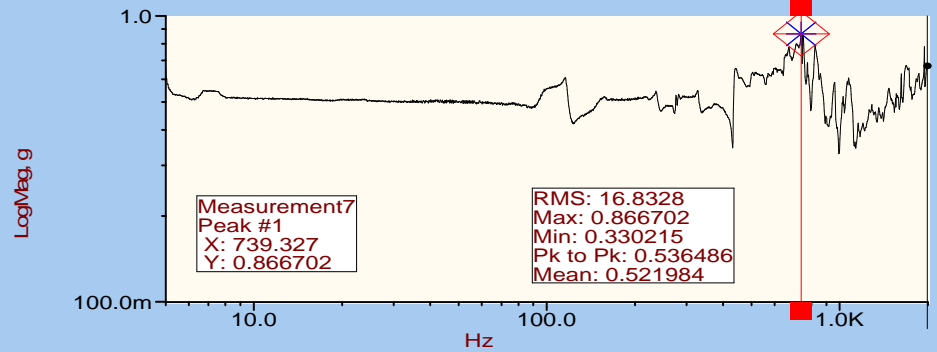
### Control;AlarmLow;AlarmHigh;AbortLow;Abo



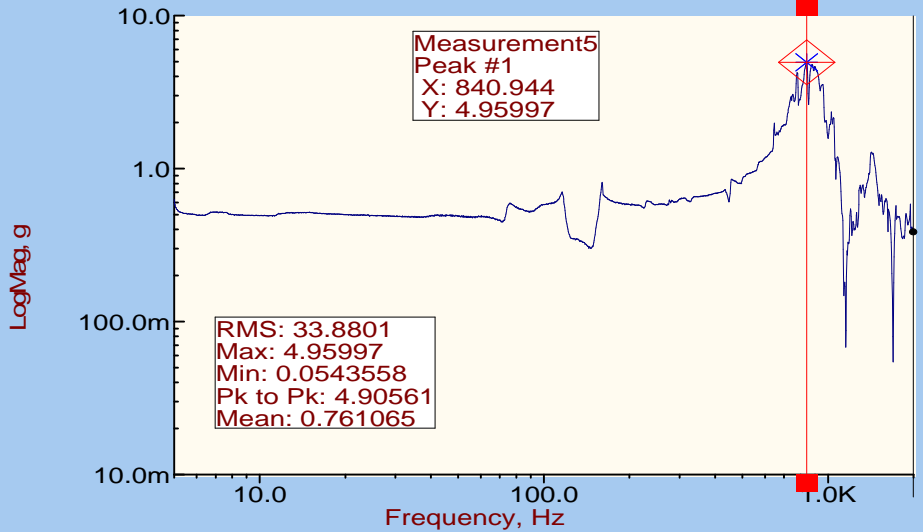
### REAR TOP CORNER E BOX Y AXIS



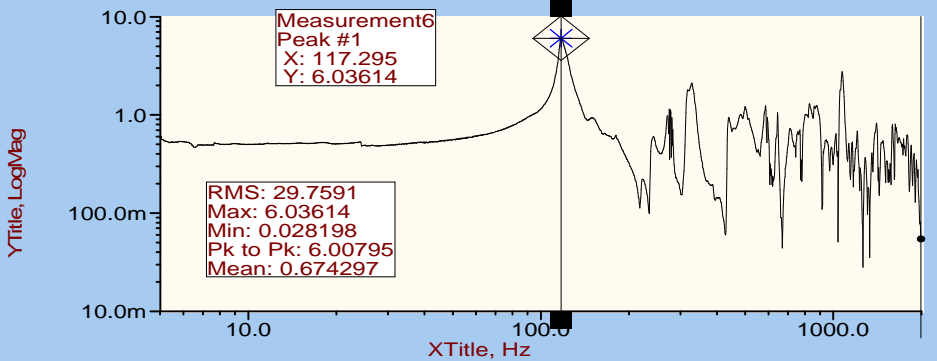
### REAR END BAFFLE Y AXIS



### TOP END COLD FINGER Y AXIS



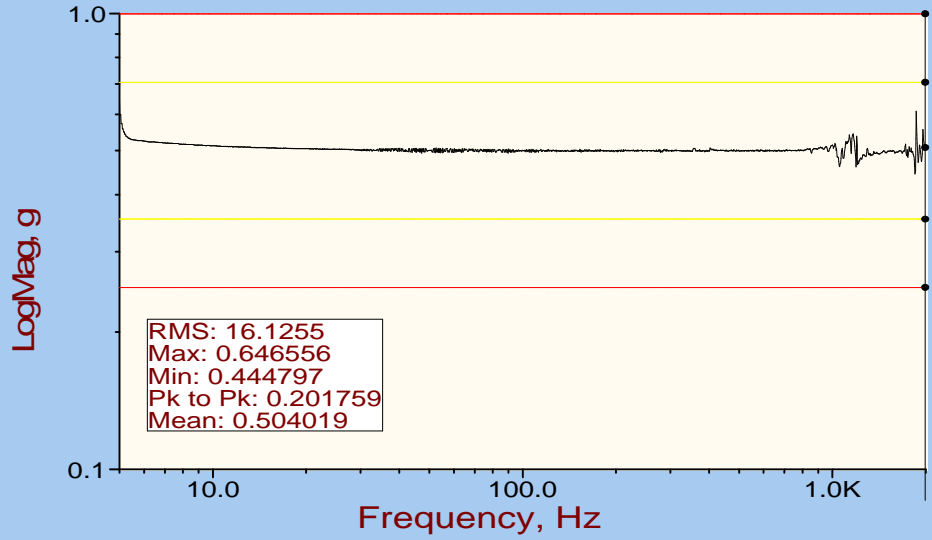
### TOP CORNER BAFFLE Y AXIS



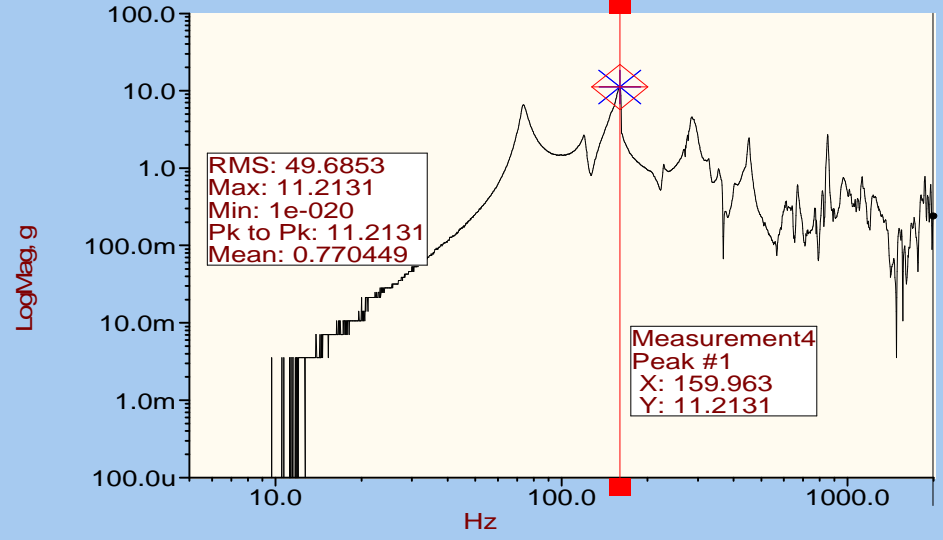
SMEI FM3 CAMERA POST RANDOM SINE SURVEY  
 RUN 00002  
 Y AXIS  
 14:19:44 04/01/2001

FIG 4b

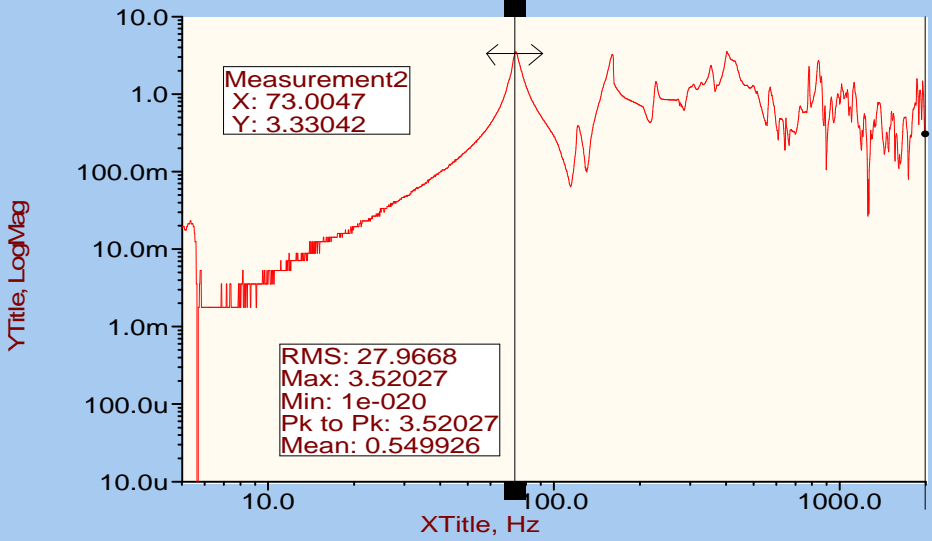
**Control;AlarmLow;AlarmHigh;AbortLow;Abo**



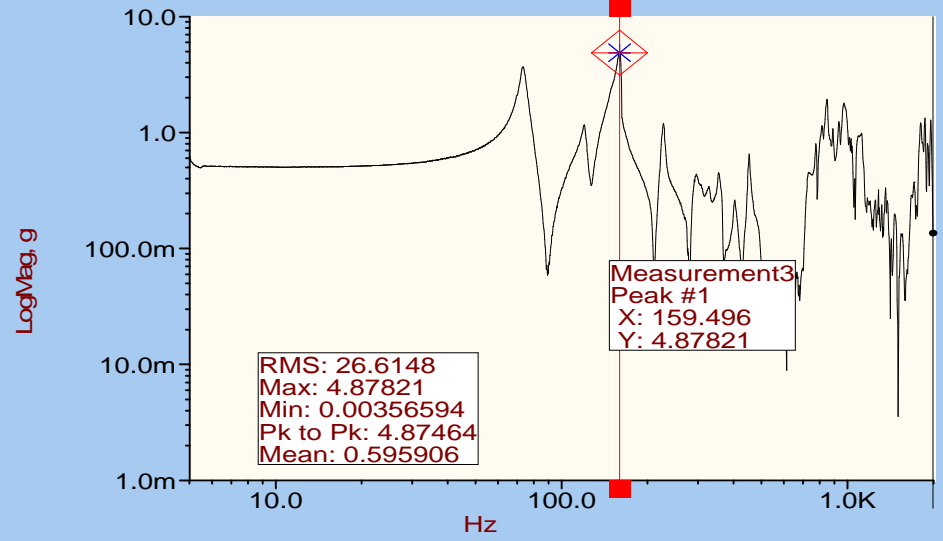
**TOP CORNER RADIATOR X AXIS**



**TOP CORNER RADIATOR Y AXIS**



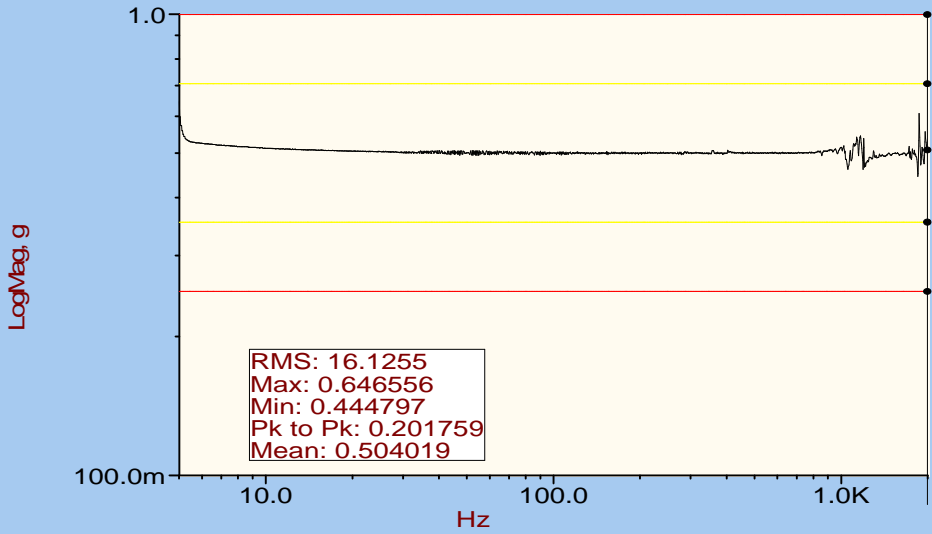
**TOP CORNER RADIATOR Z AXIS**



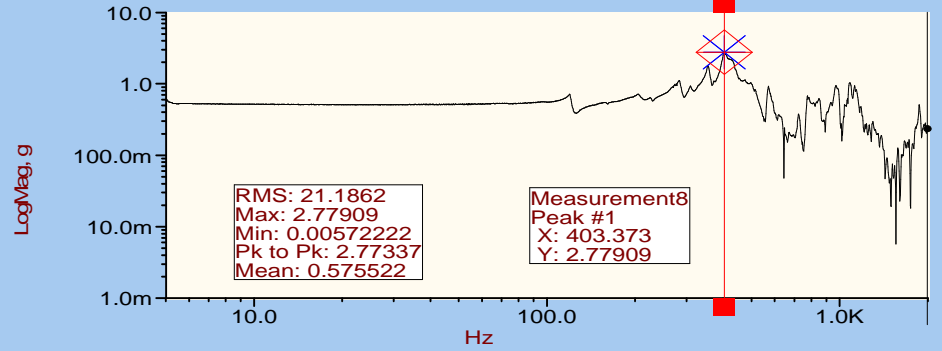
SMEI FM3 CAMERA SINE SURVEY  
 RUN 00003  
 Z AXIS  
 15:46:46 04/01/2001

FIG 5a

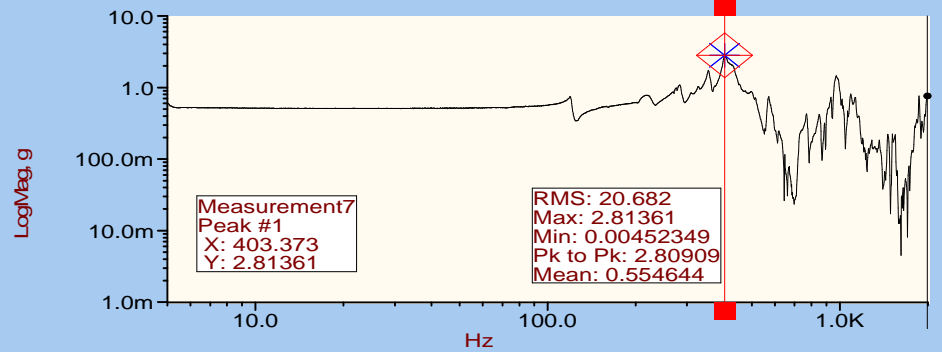
### Control;AlarmLow;AlarmHigh;AbortLow;Abo



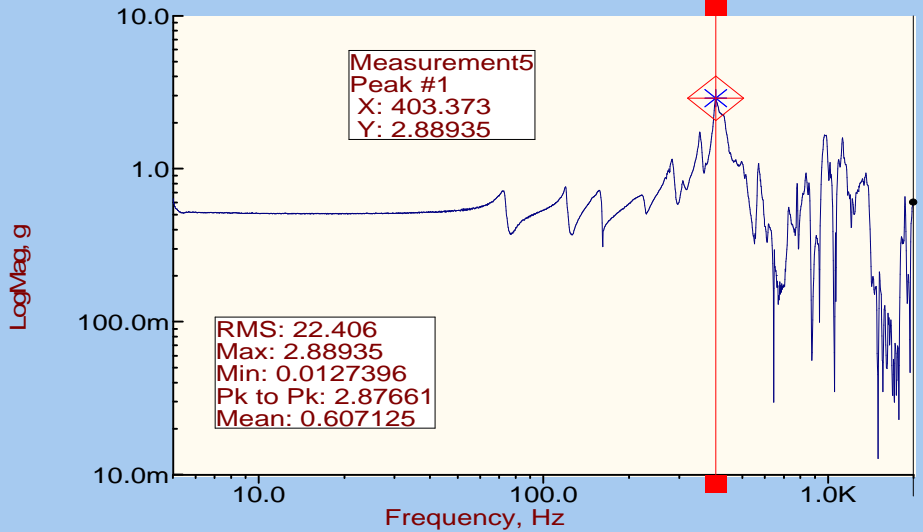
### REAR TOP CORNER E BOX Z AXIS



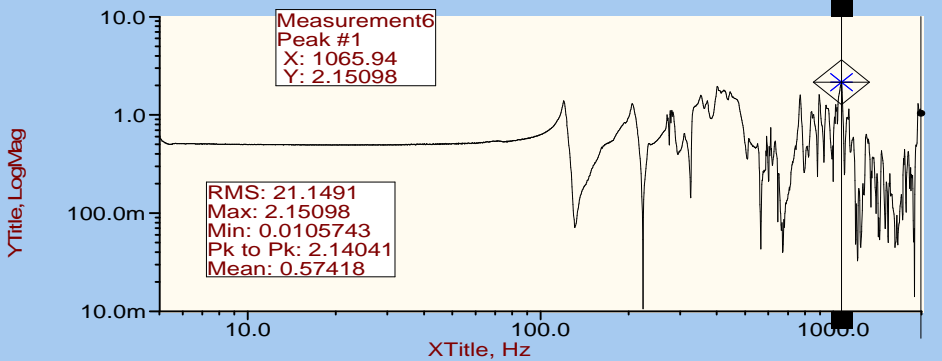
### REAR END Baffle Z AXIS



### TOP END COLD FINGER Z AXIS



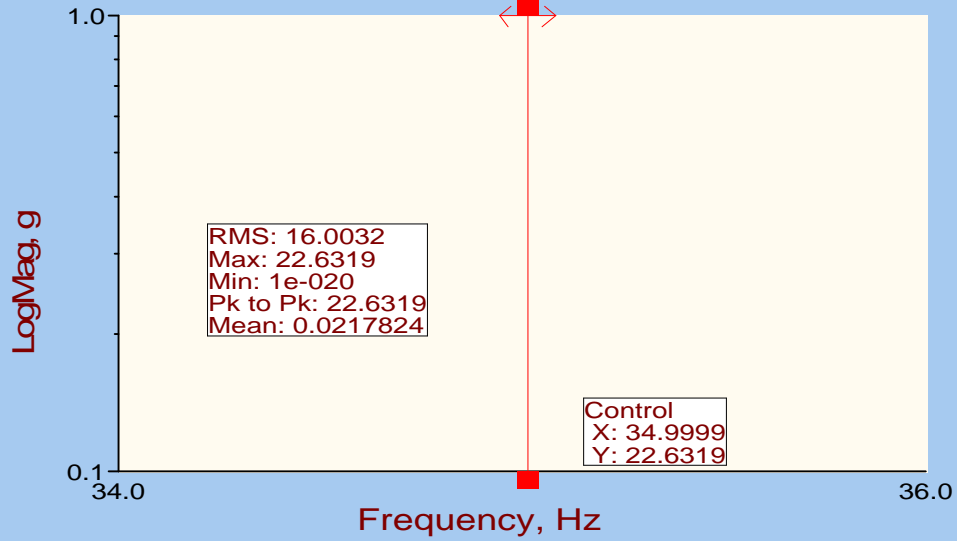
### TOP CORNER Baffle Z AXIS



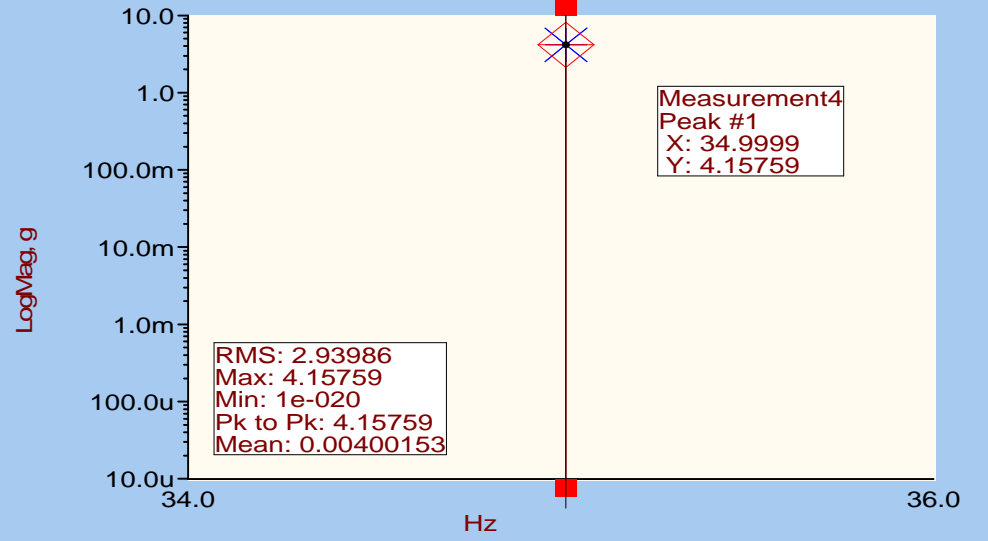
SMEI FM3 CAMERA SINE SURVEY  
RUN 00003  
Z AXIS  
15:46:46 04/01/2001

FIG 5b

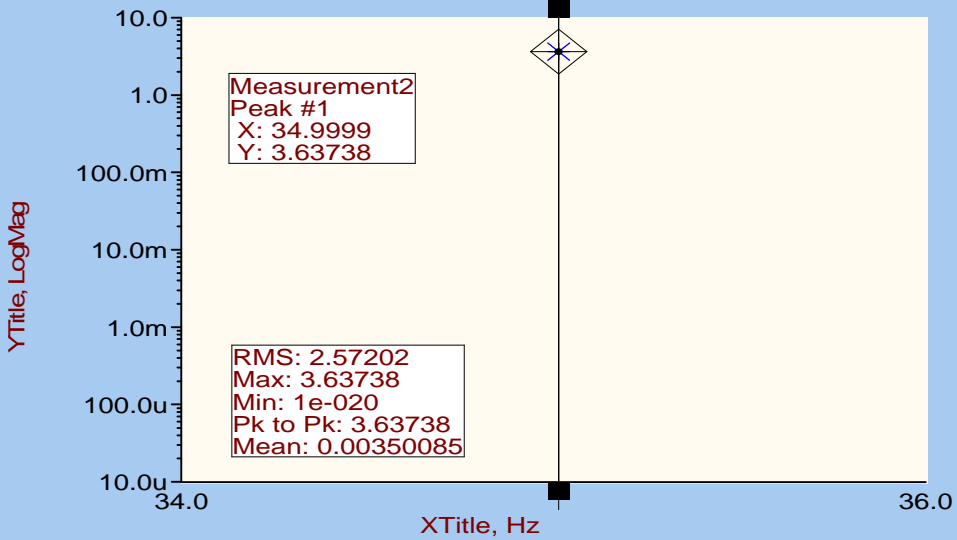
### Control



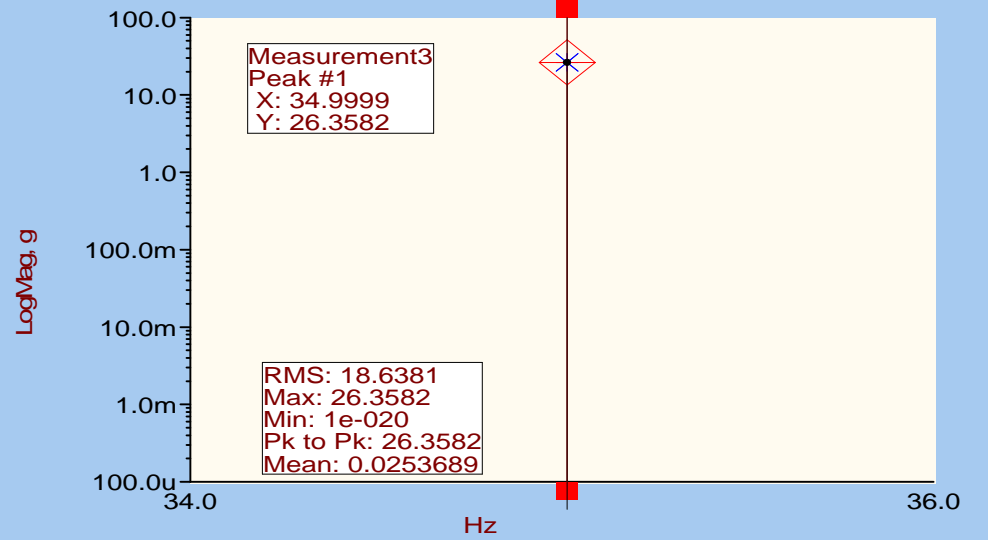
### TOP CORNER RADIATOR X AXIS



### TOP CORNER RADIATOR Y AXIS



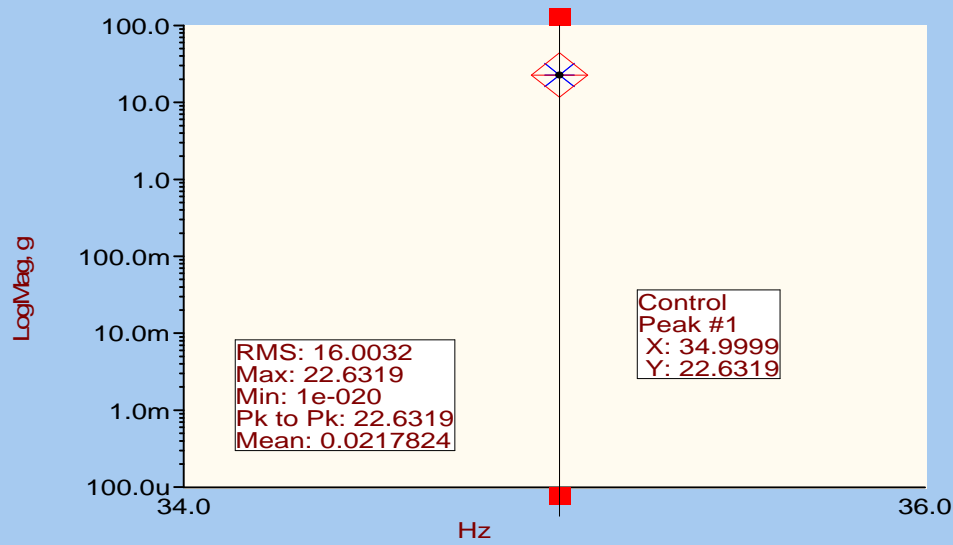
### TOP CORNER RADIATOR Z AXIS



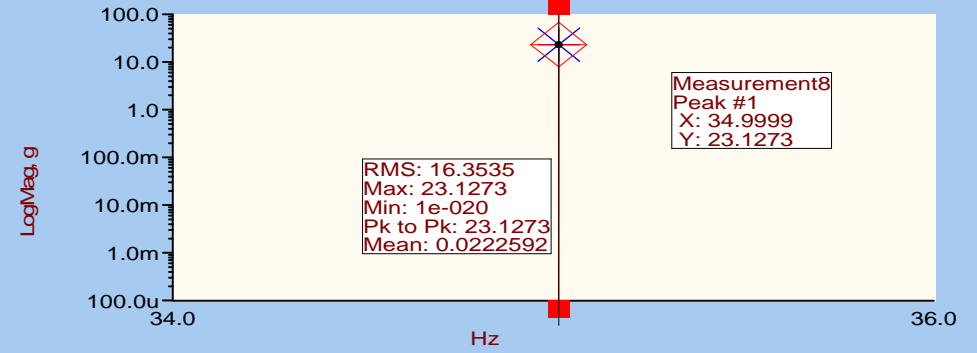
SMEI FM3 CAMERA STATIC LOAD  
RUN 00002  
Z AXIS  
15:52:06 04/01/2001

FIG 6a

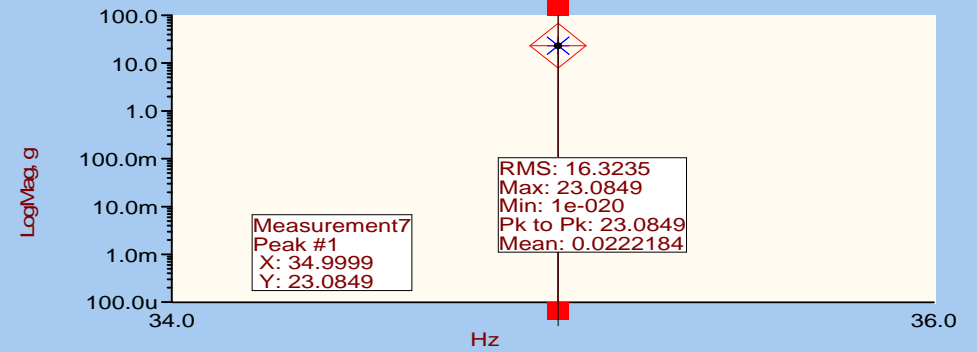
### Control



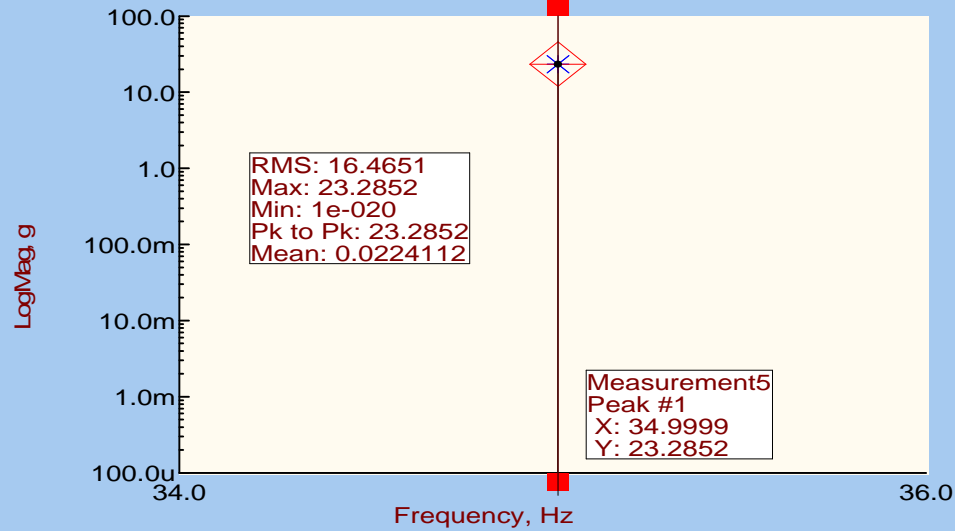
### REAR TOP CORNER E BOX Z AXIS



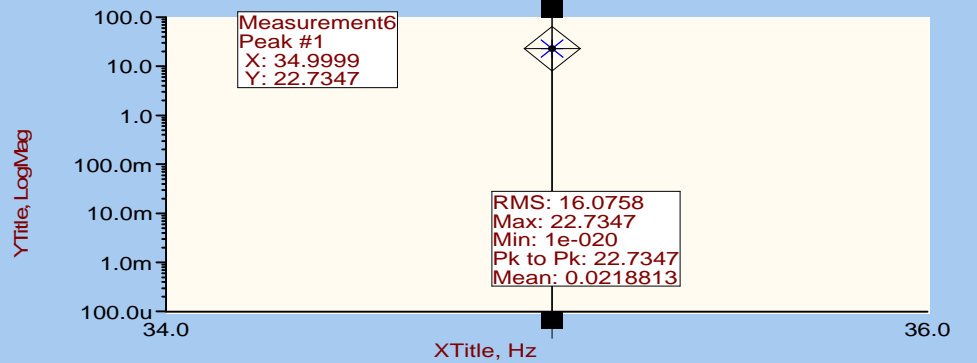
### REAR END Baffle Z AXIS



### TOP END COLD FINGER Z AXIS



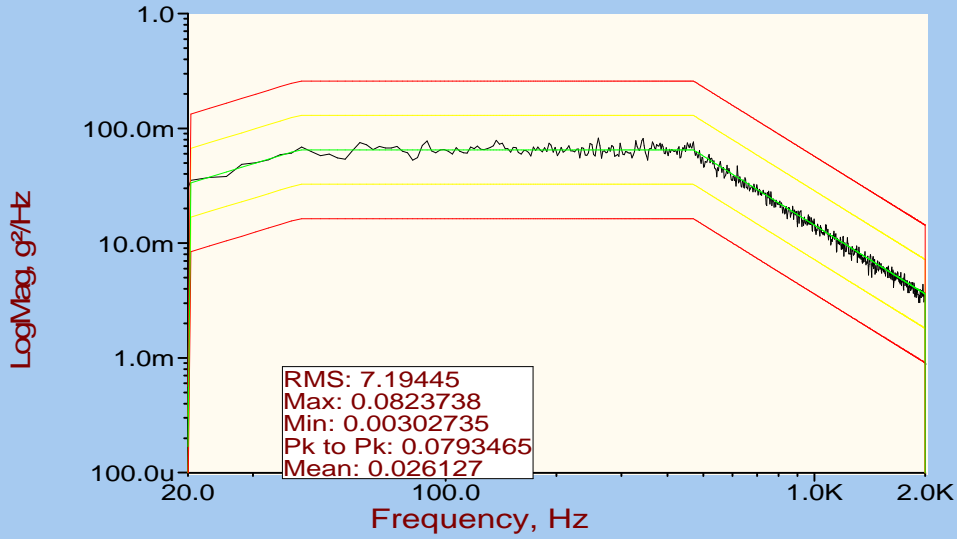
### TOP CORNER Baffles Z AXIS



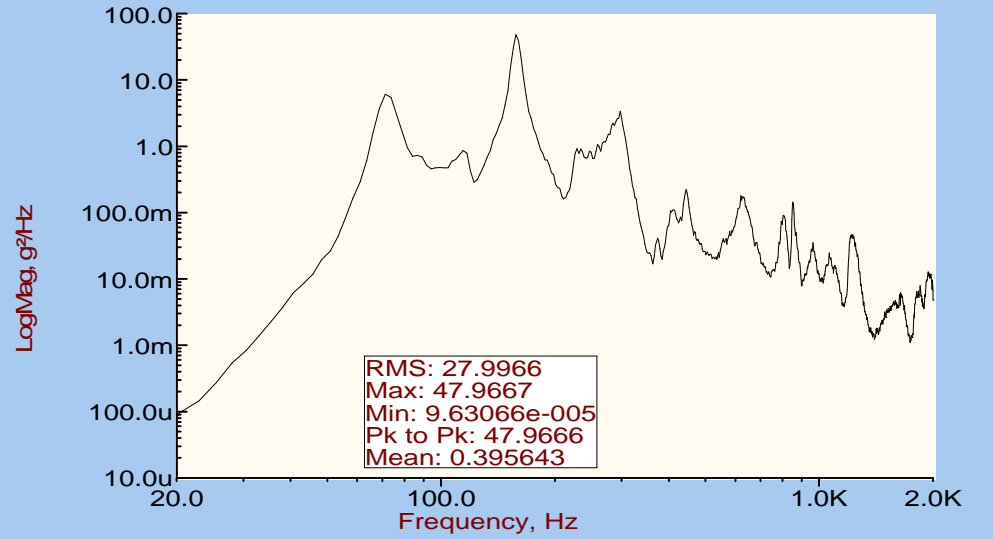
SMEI FM3 CAMERA STATIC LOAD  
RUN 00002  
Z AXIS  
15:52:06 04/01/2001

FIG 6b

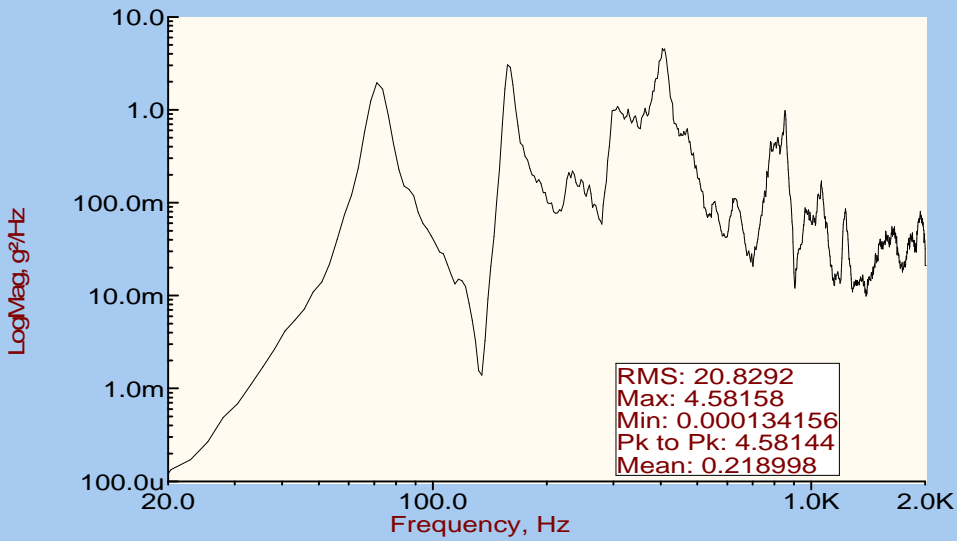
### Control;AlarmLow;AlarmHigh;AbortLow;Abo



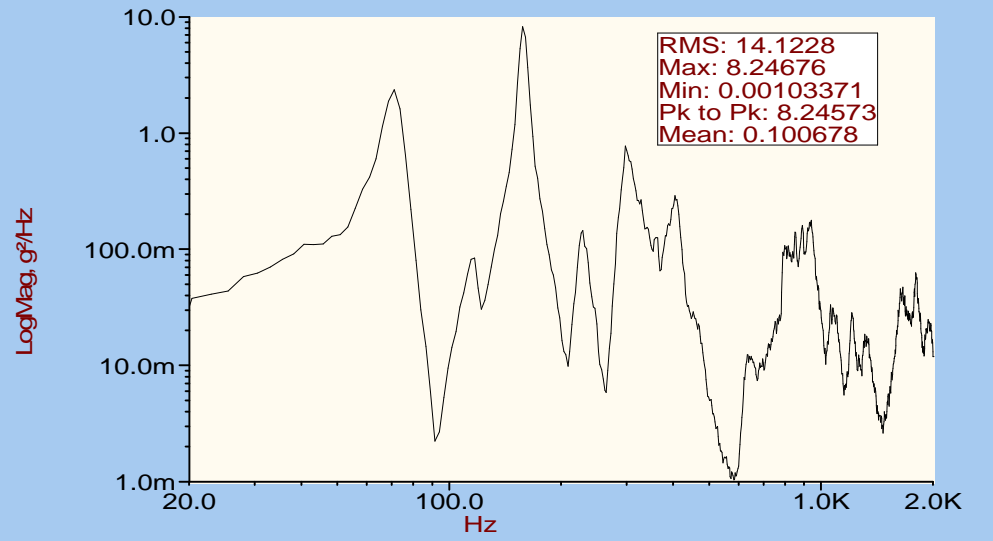
### TOP CORNER RADIATOR X AXIS



### TOP CORNER RADIATOR Y AXIS



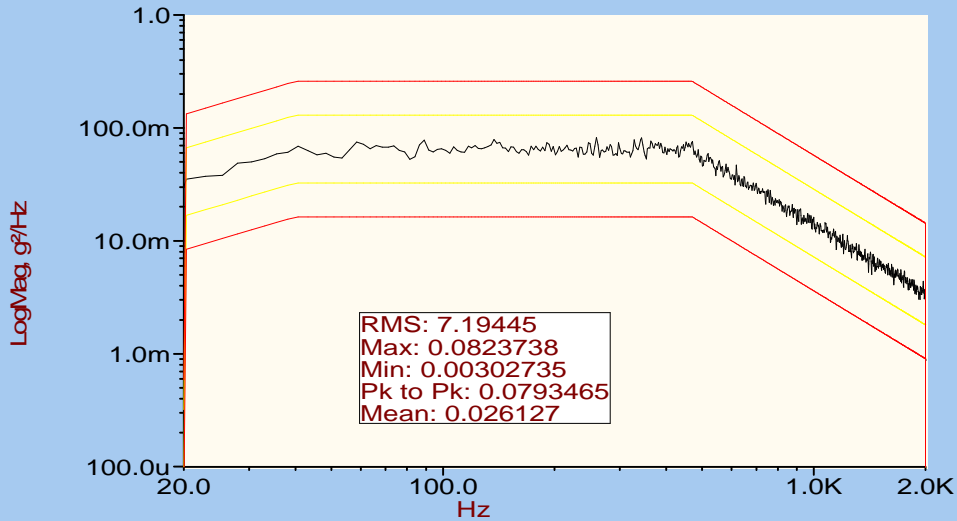
### TOP CORNER RADIATOR Z AXIS



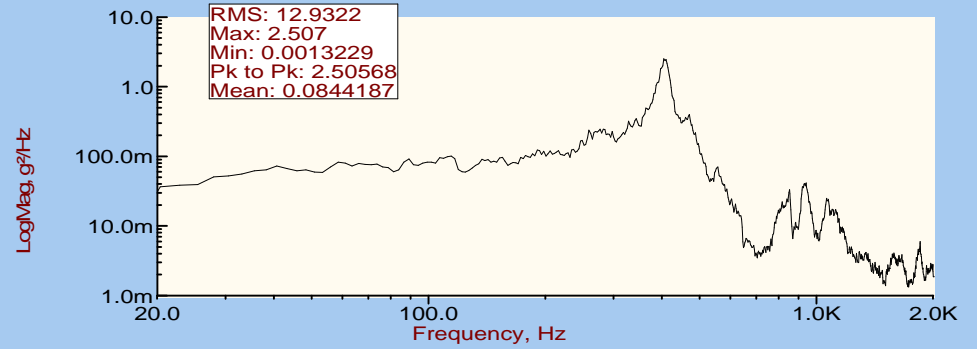
SMEI FM3 CAMERA RANDOM  
RUN 00002  
Z AXIS  
15:54:10 04/01/2001

FIG 7a

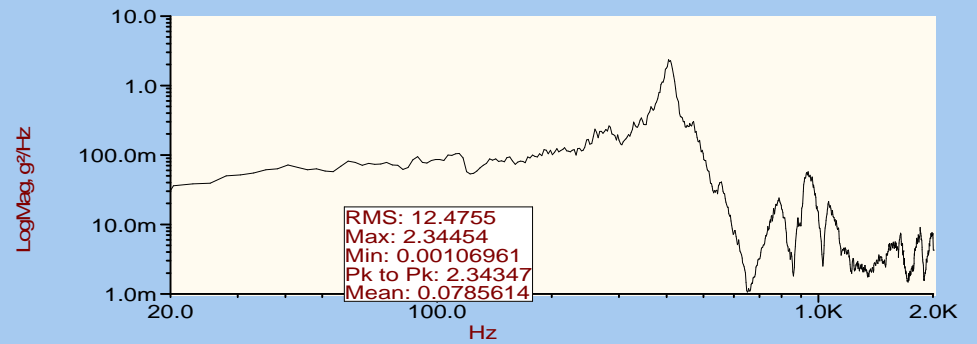
### Control;AlarmLow;AlarmHigh;AbortLow;Abo



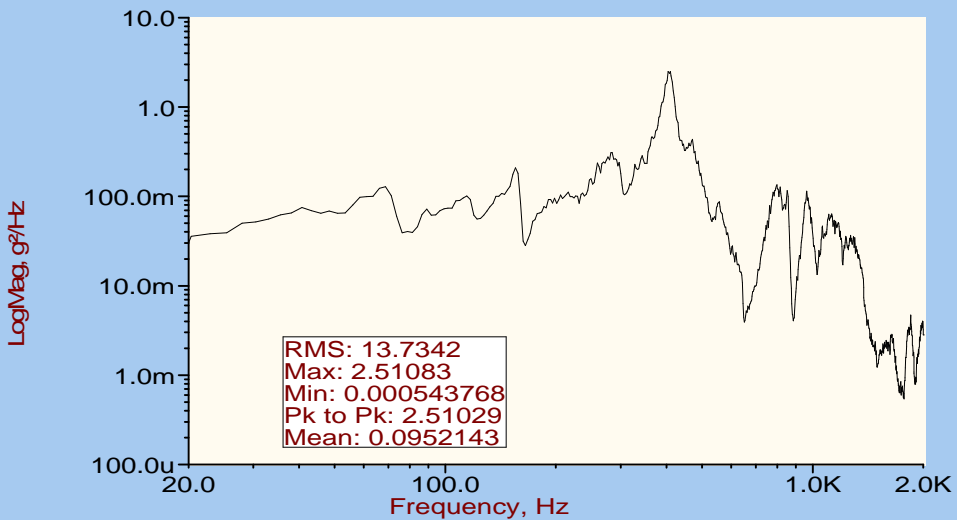
### REAR TOP CORNER E BOX Z AXIS



### REAR END Baffle Z AXIS



### TOP END COLD FINGER Z AXIS



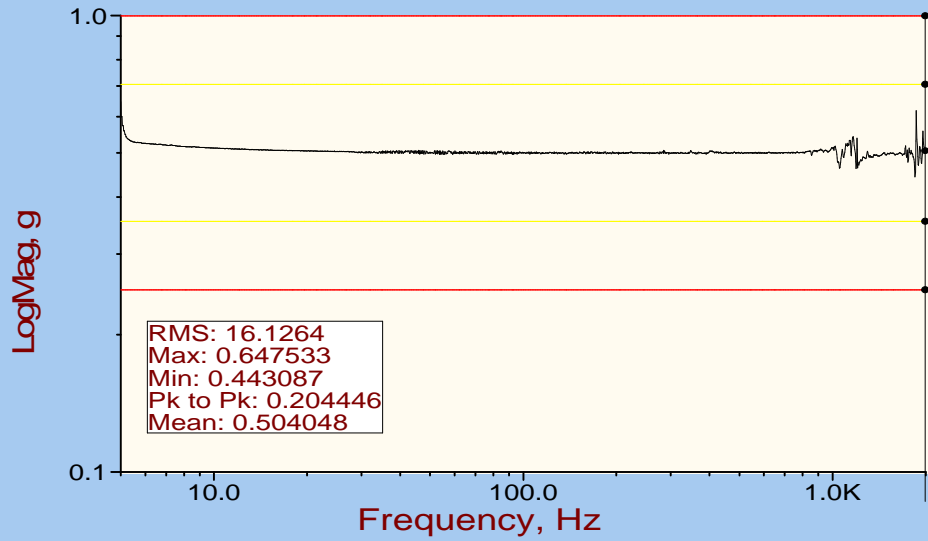
### TOP CORNER Baffles Z AXIS



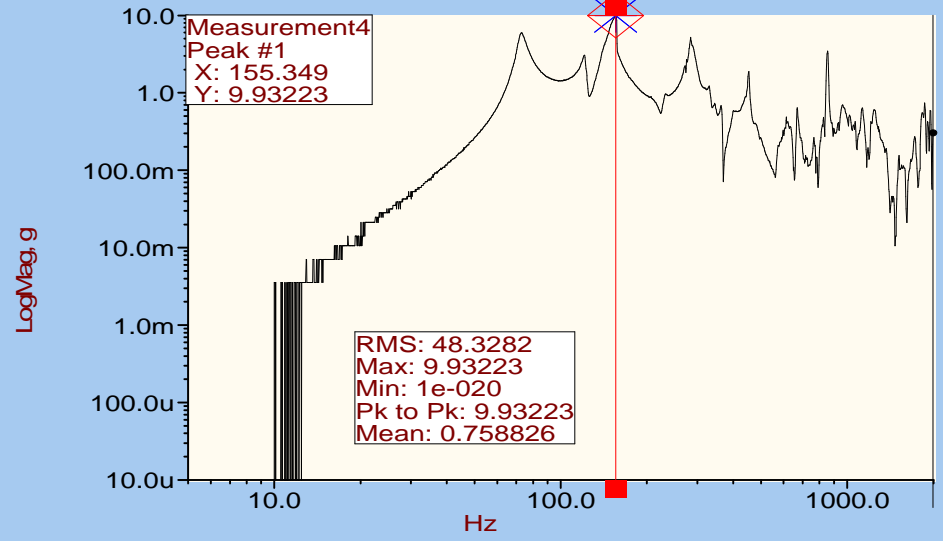
SMEI FM3 CAMERA RANDOM  
RUN 00002  
Z AXIS  
15:54:10 04/01/2001

FIG 7b

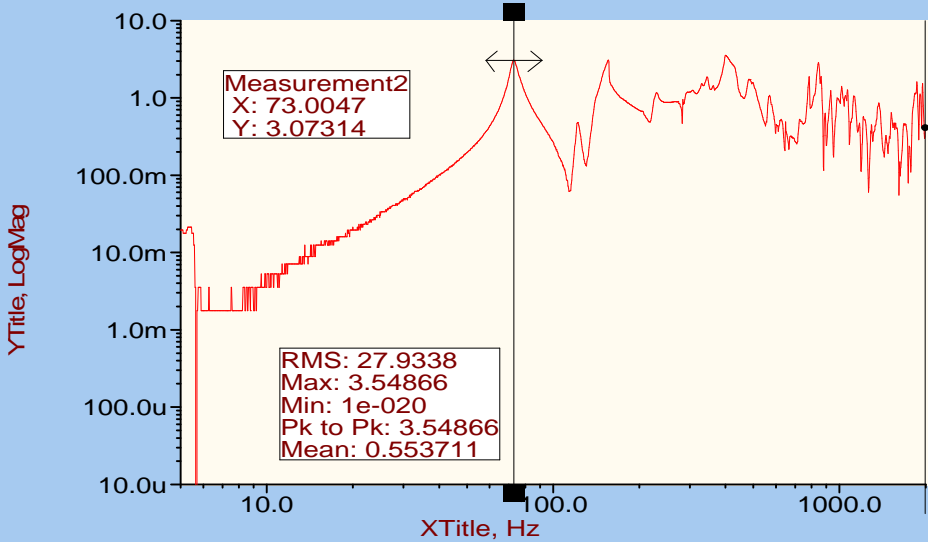
### Control;AlarmLow;AlarmHigh;AbortLow;Abo



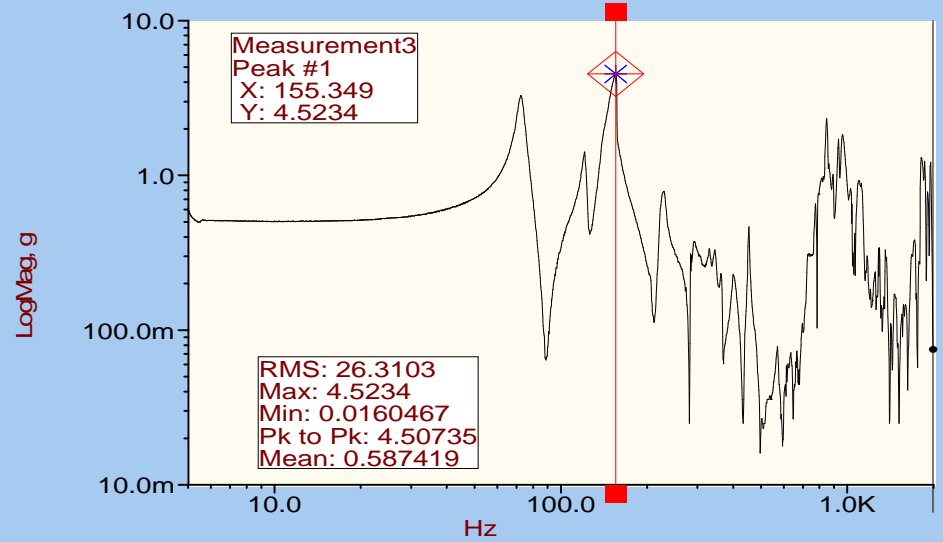
### TOP CORNER RADIATOR X AXIS



### TOP CORNER RADIATOR Y AXIS



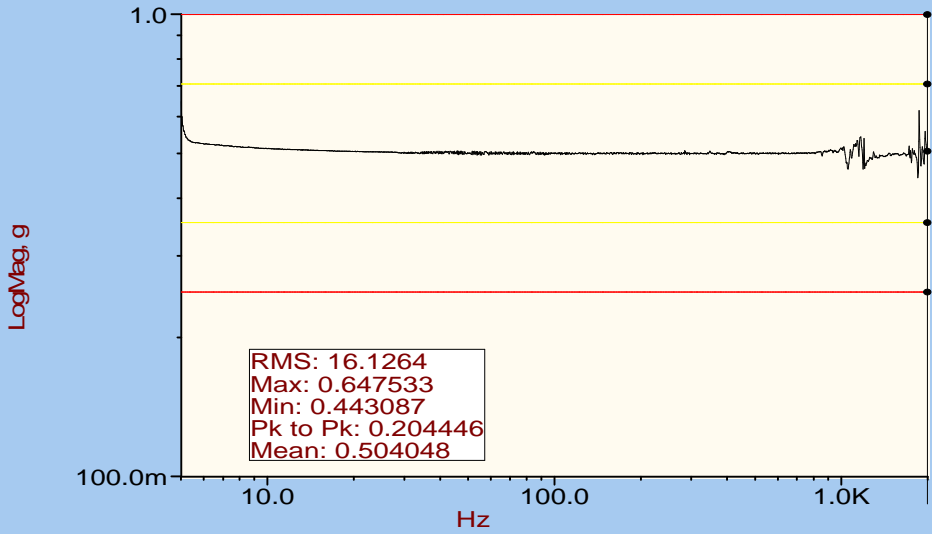
### TOP CORNER RADIATOR Z AXIS



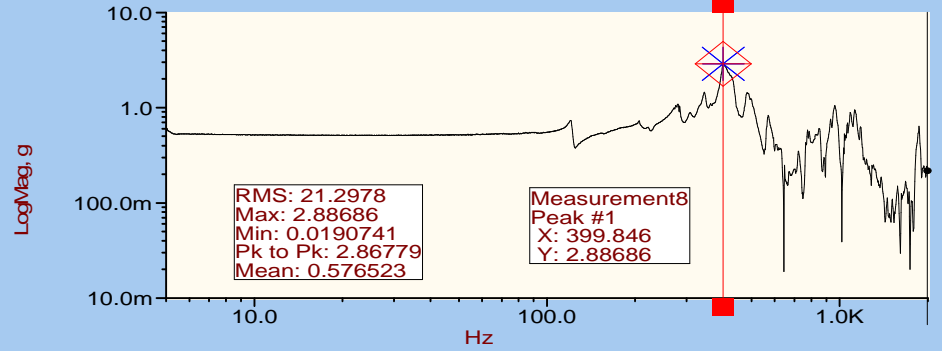
SMEI FM3 CAMERA POST RANDOM SINE SURVEY  
 RUN 00004  
 Z AXIS  
 16:00:25 04/01/2001

FIG 8a

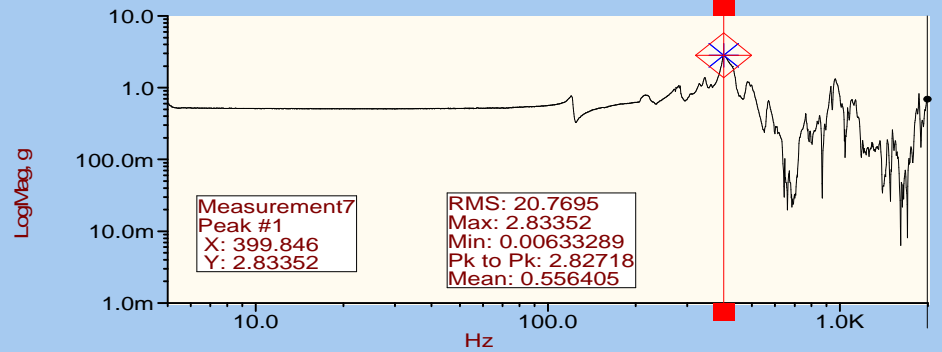
### Control;AlarmLow;AlarmHigh;AbortLow;Abo



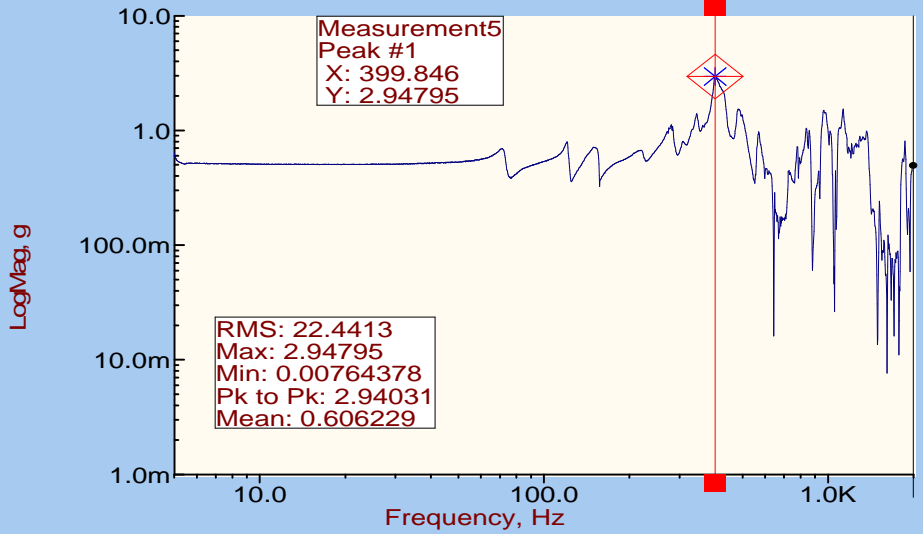
### REAR TOP CORNER E BOX Z AXIS



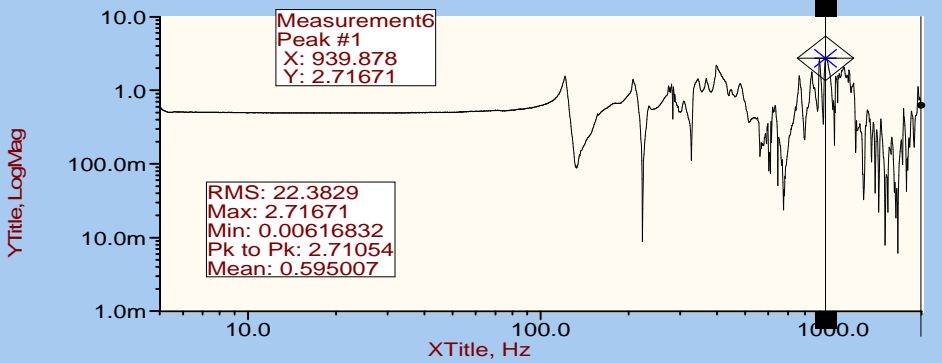
### REAR END BAFFLE Z AXIS



### TOP END COLD FINGER Z AXIS



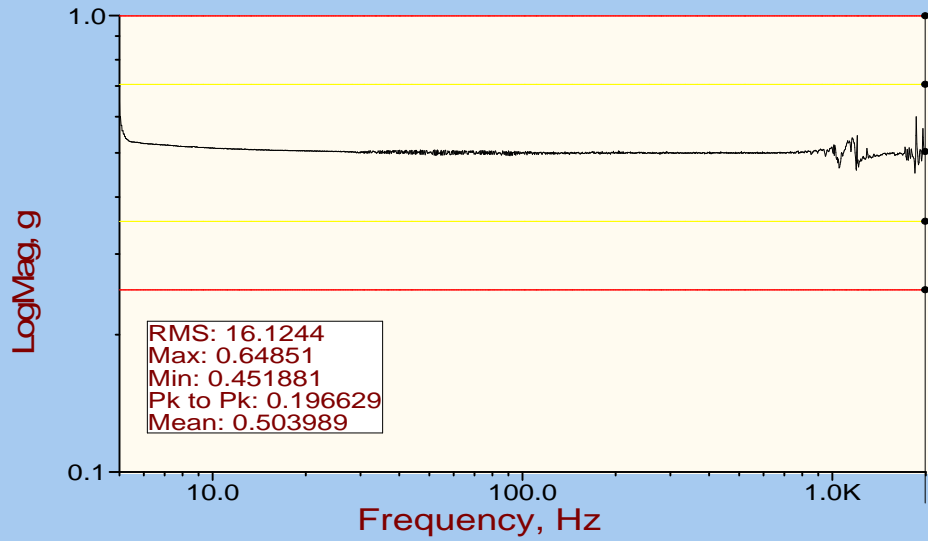
### TOP CORNER BAFFLE Z AXIS



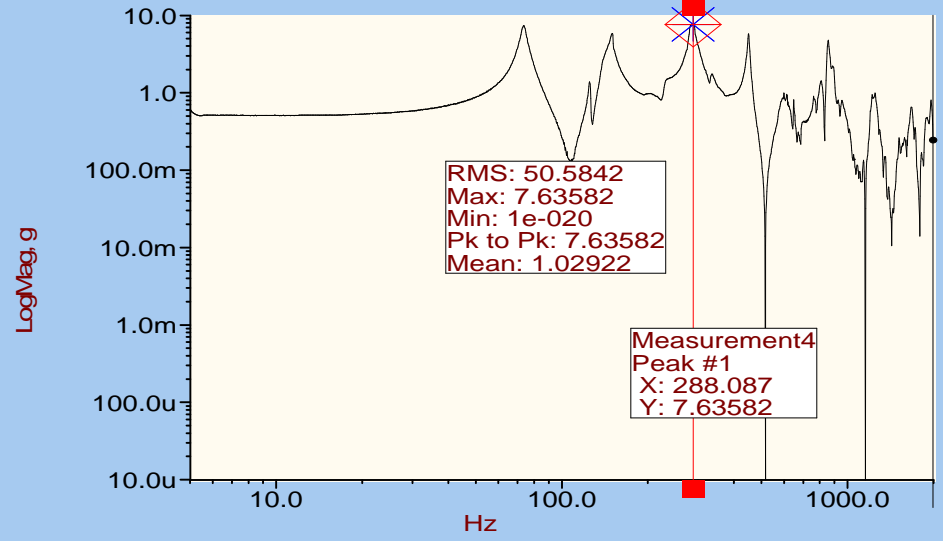
SMEI FM3 CAMERA POST RANDOM SINE SURVEY  
 RUN 00004  
 Z AXIS  
 16:00:25 04/01/2001

FIG 8b

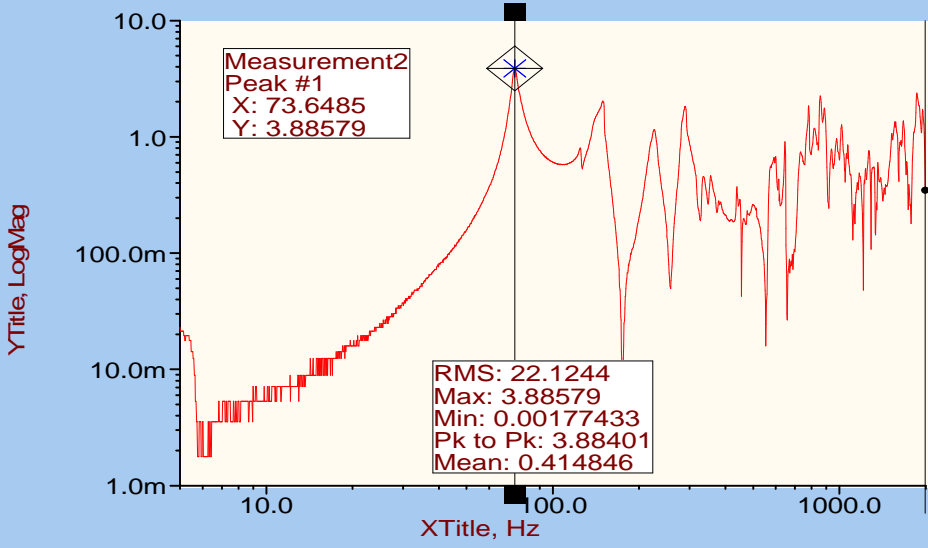
### Control;AlarmLow;AlarmHigh;AbortLow;Abo



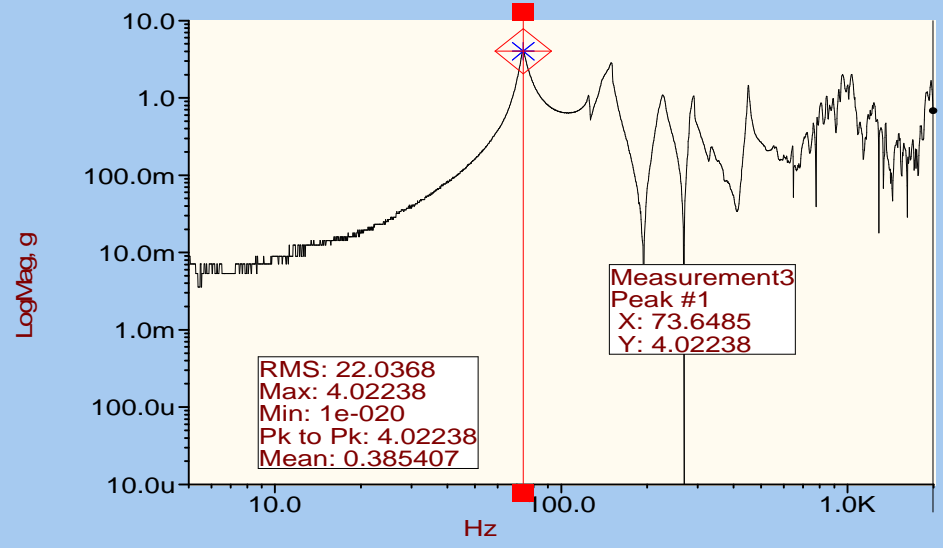
### TOP CORNER RADIATOR X AXIS



### TOP CORNER RADIATOR Y AXIS



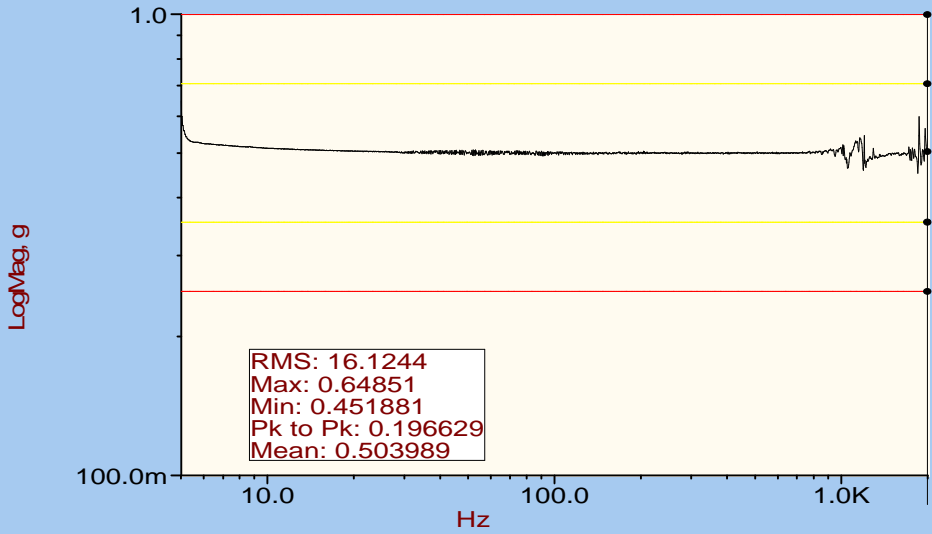
### TOP CORNER RADIATOR Z AXIS



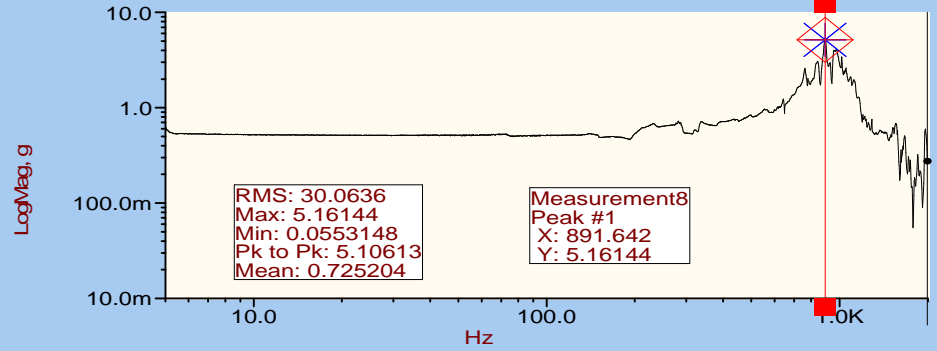
SMEI FM3 CAMERA SINE SURVEY  
 RUN 00005  
 X AXIS  
 11:22:36 05/01/2001

FIG 9a

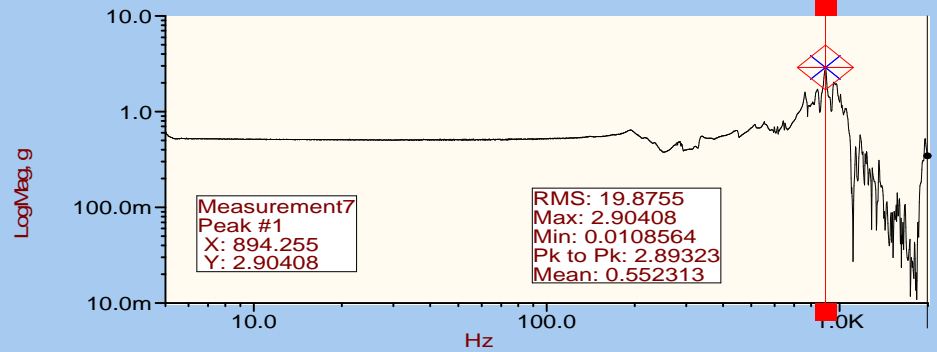
### Control;AlarmLow;AlarmHigh;AbortLow;Abo



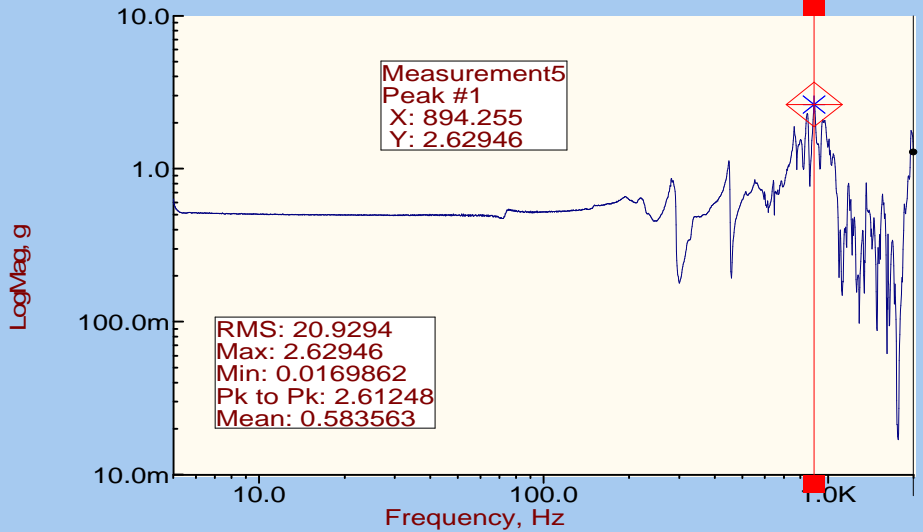
### REAR TOP CORNER E BOX X AXIS



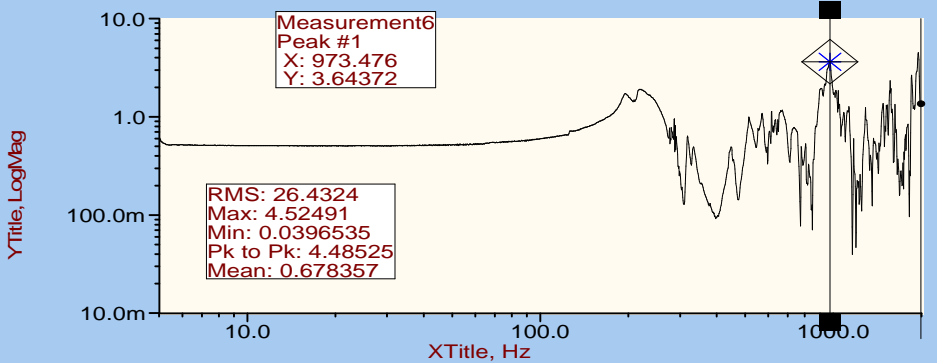
### REAR END BAFFLE X AXIS



### TOP END COLD FINGER X AXIS



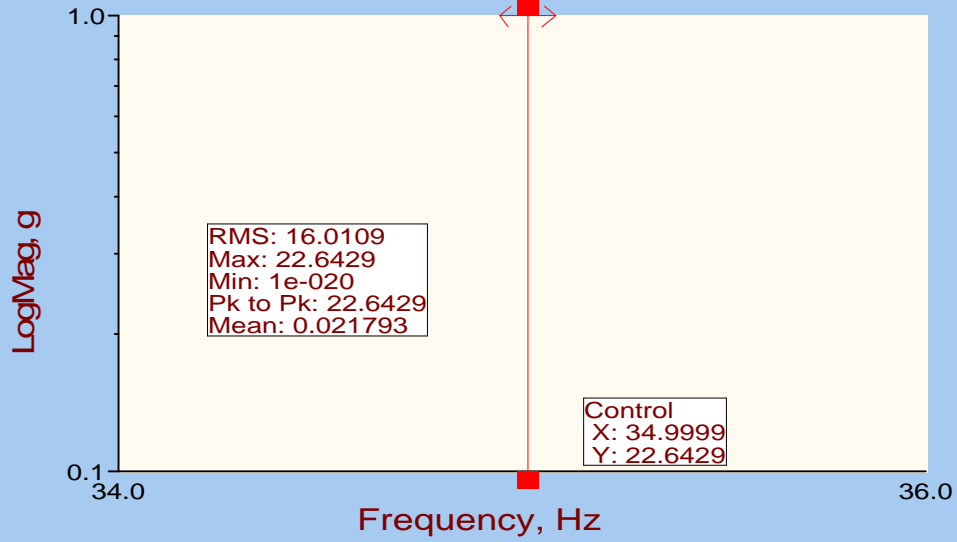
### TOP CORNER BAFFLE X AXIS



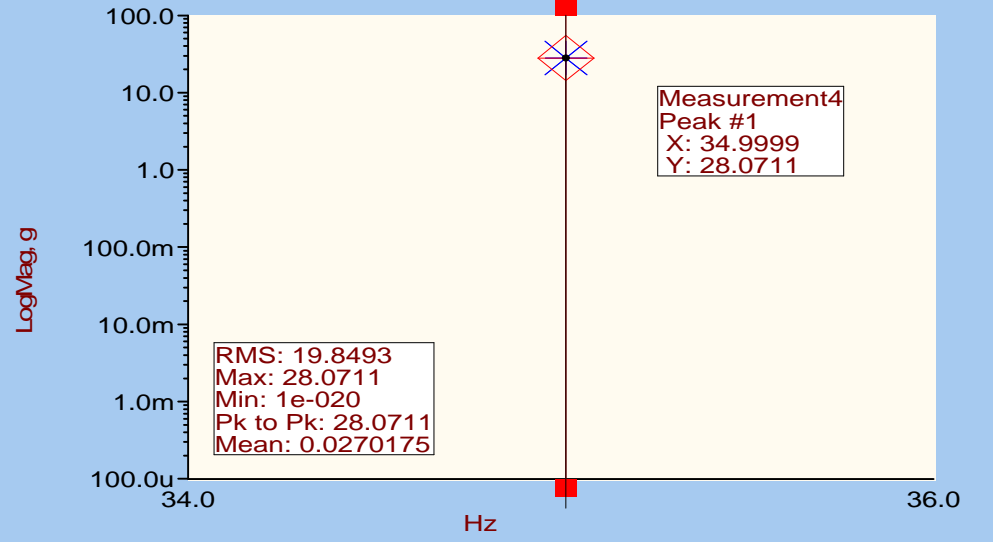
SMEI FM3 CAMERA SINE SURVEY  
 RUN 00005  
 X AXIS  
 11:22:36 05/01/2001

FIG 9b

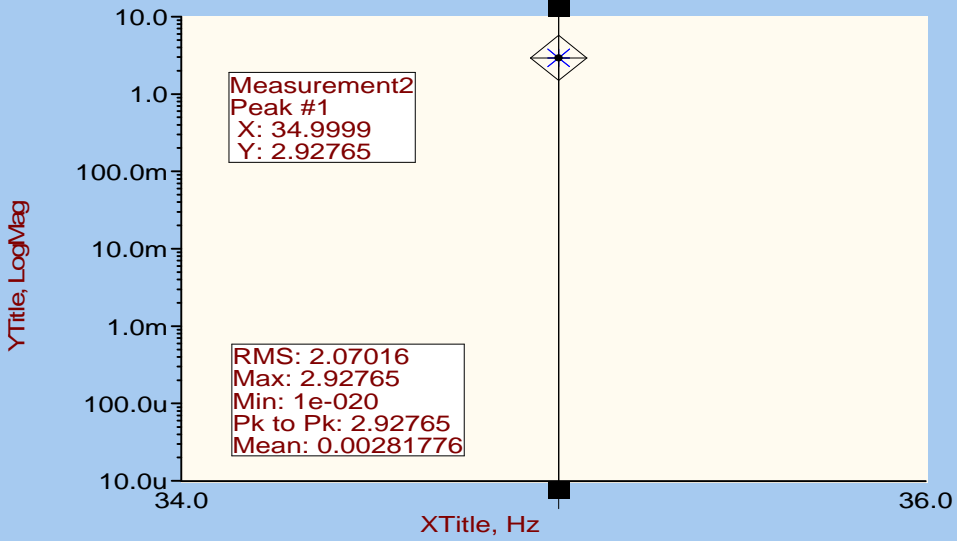
### Control



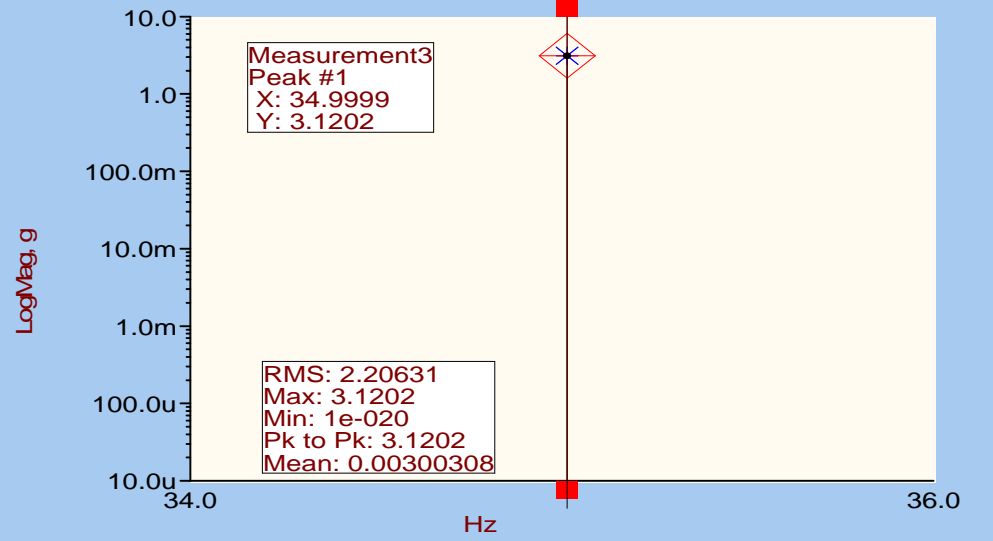
### TOP CORNER RADIATOR X AXIS



### TOP CORNER RADIATOR Y AXIS



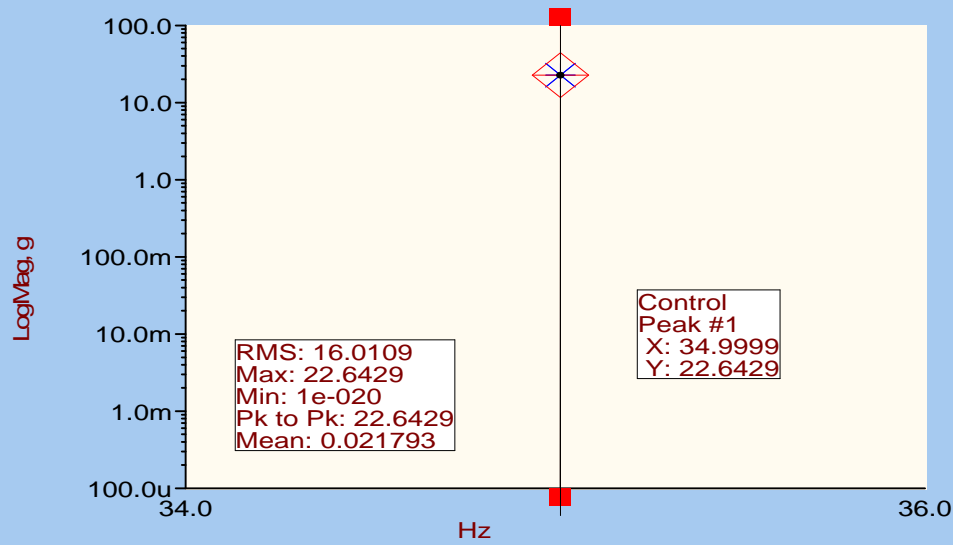
### TOP CORNER RADIATOR Z AXIS



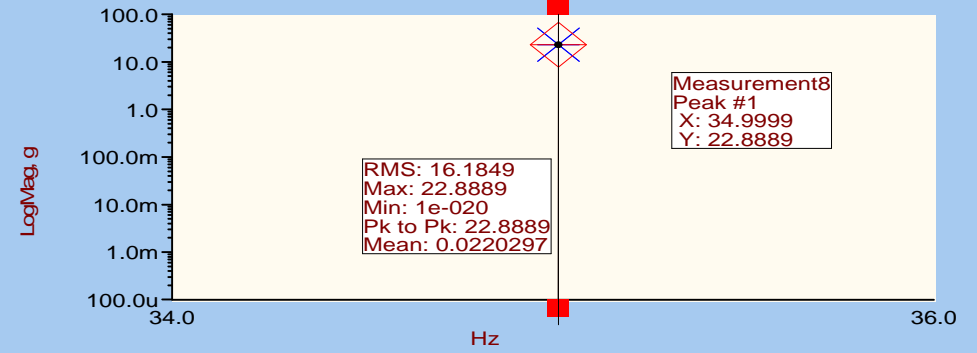
SMEI FM3 CAMERA STATIC LOAD  
RUN 00003  
X AXIS  
11:27:40 05/01/2001

FIG 10a

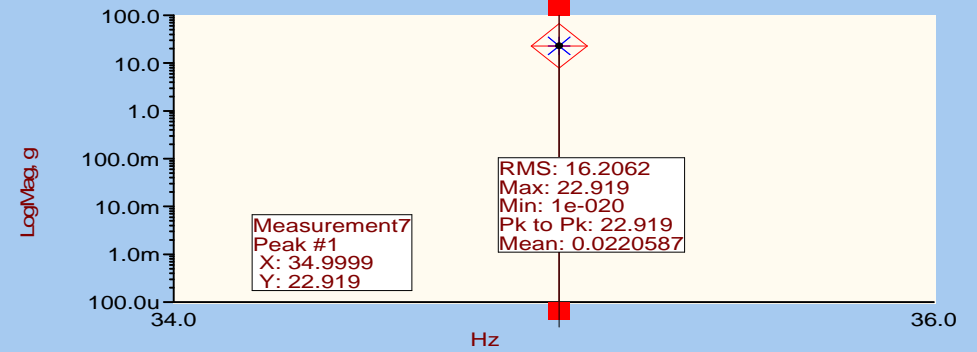
### Control



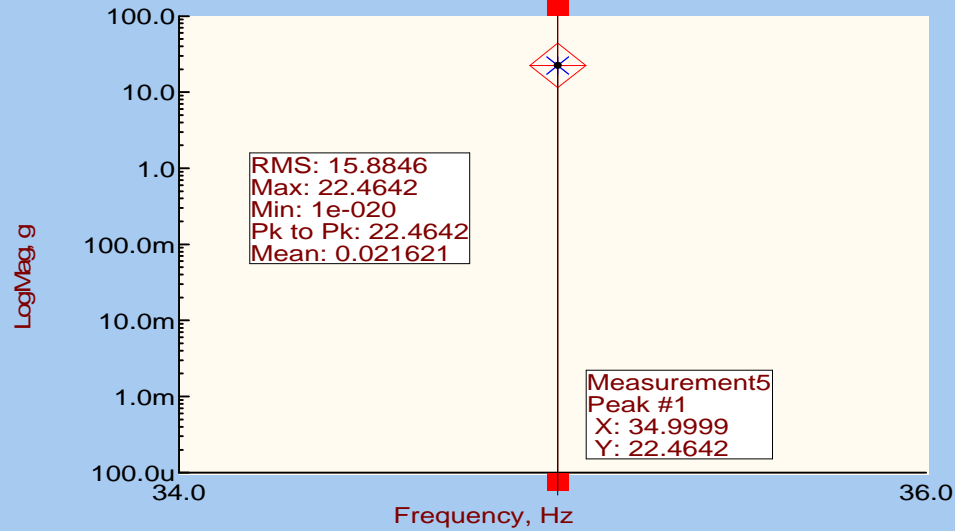
### REAR TOP CORNER E BOX X AXIS



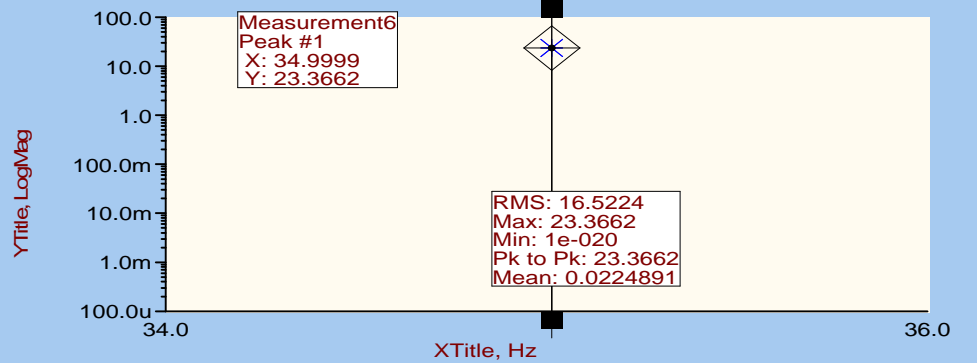
### REAR END Baffle X AXIS



### TOP END COLD FINGER X AXIS



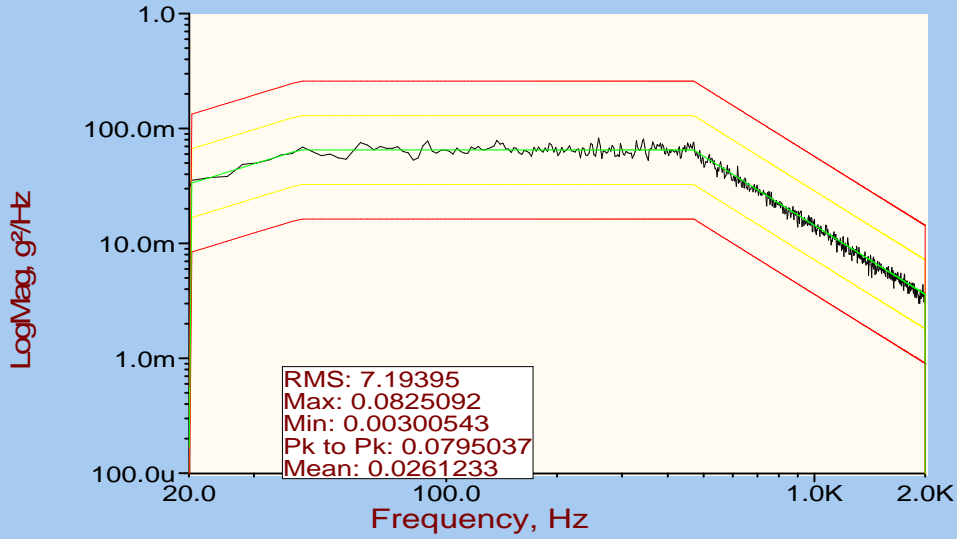
### TOP CORNER Baffles X AXIS



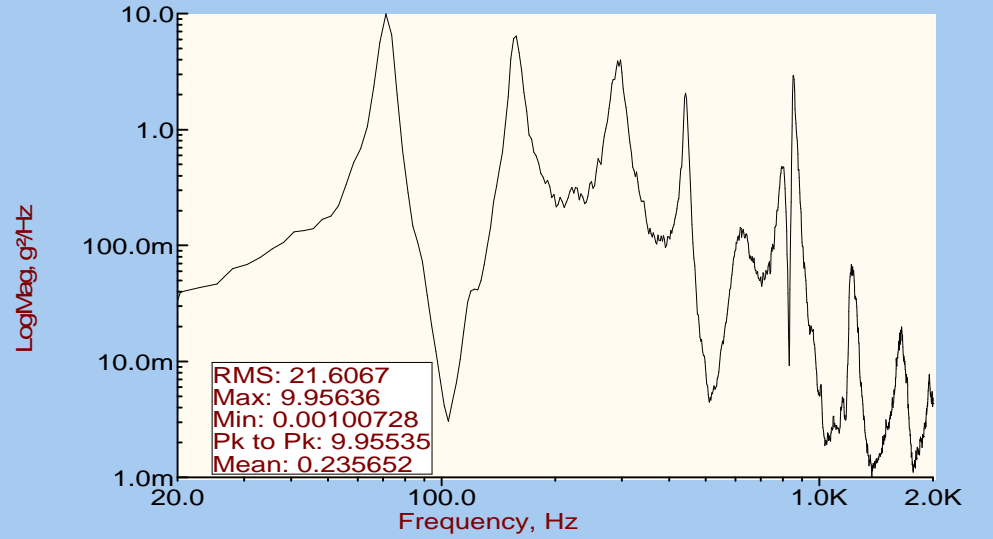
SMEI FM3 CAMERA STATIC LOAD  
RUN 00003  
X AXIS  
11:27:40 05/01/2001

FIG10b

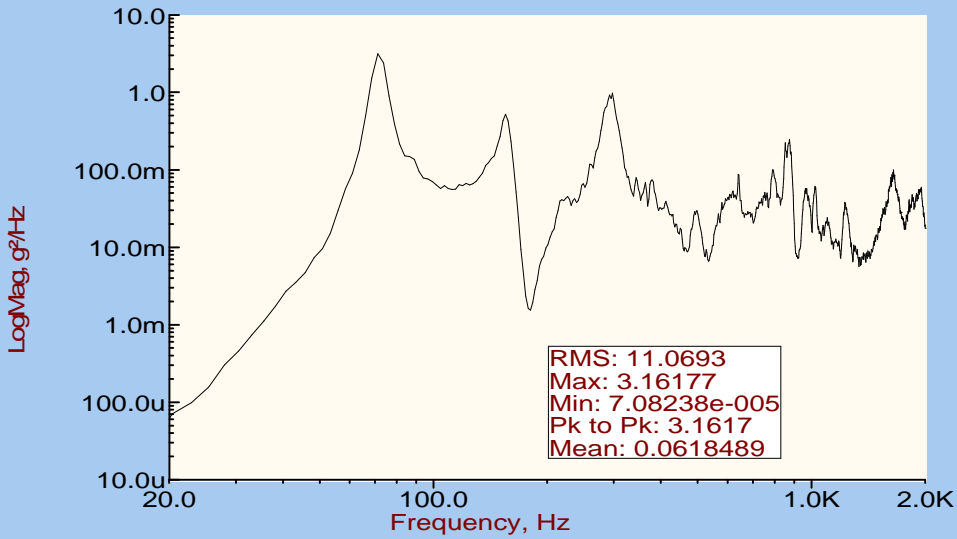
### Control;AlarmLow;AlarmHigh;AbortLow;Abo



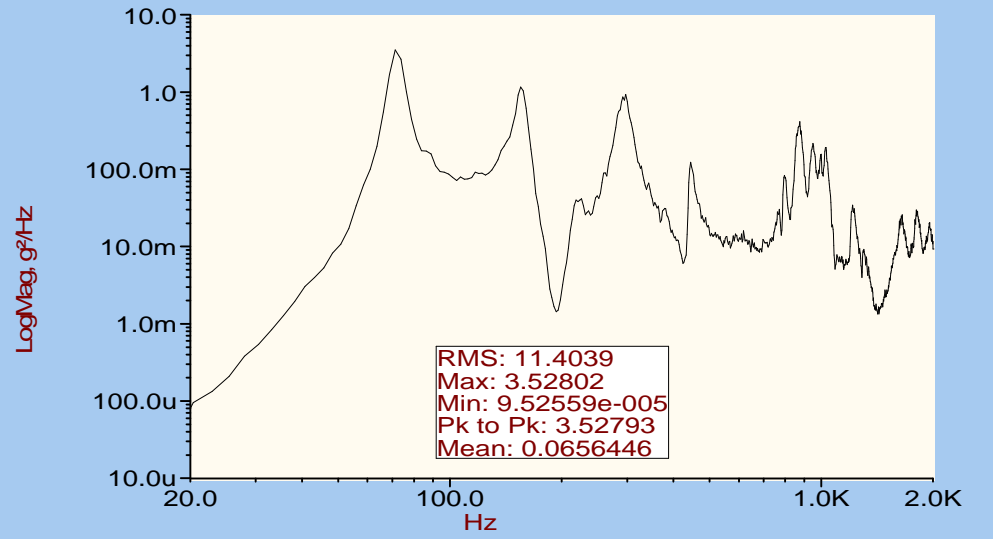
### TOP CORNER RADIATOR X AXIS



### TOP CORNER RADIATOR Y AXIS



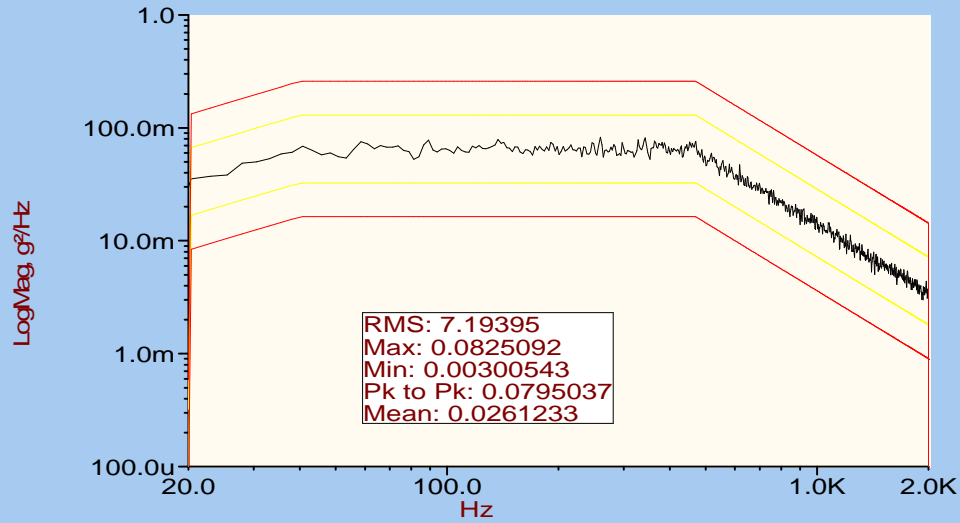
### TOP CORNER RADIATOR Z AXIS



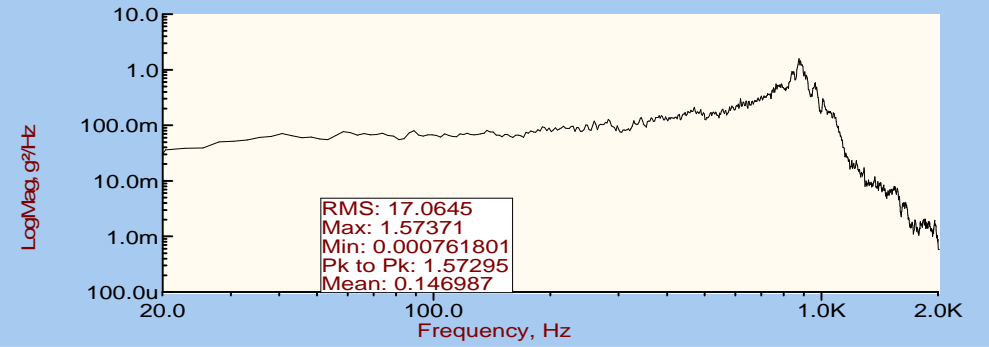
SMEI FM3 CAMERA RANDOM  
RUN 00003  
X AXIS  
11:28:50 05/01/2001

FIG 11a

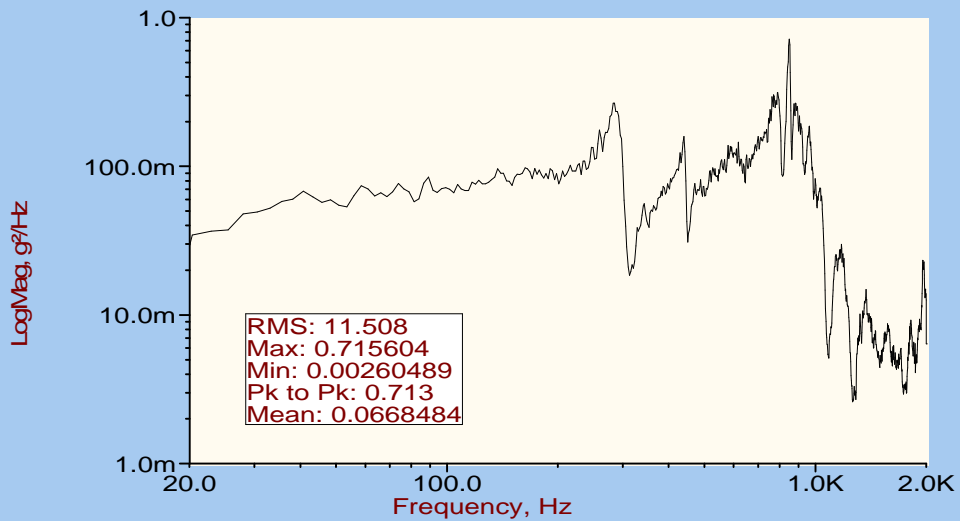
### Control;AlarmLow;AlarmHigh;AbortLow;Abo



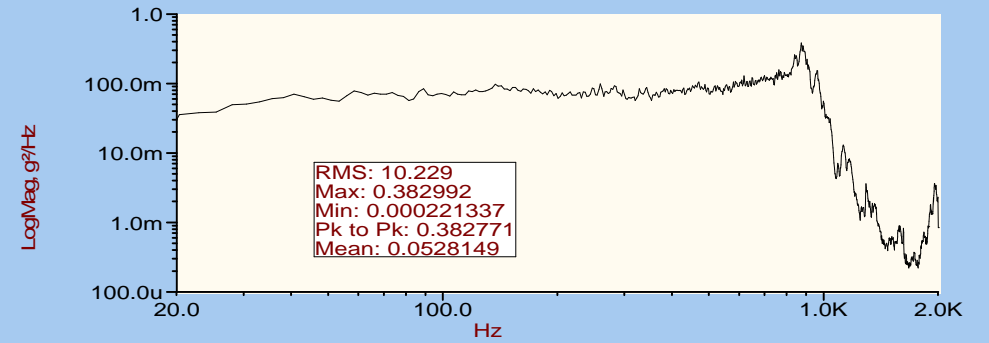
### REAR TOP CORNER E BOX X AXIS



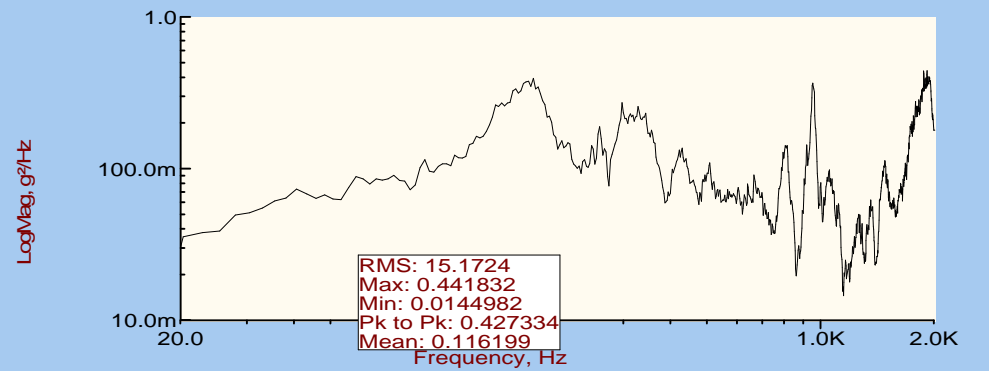
### TOP END COLD FINGER X AXIS



### REAR END BAFFLE X AXIS



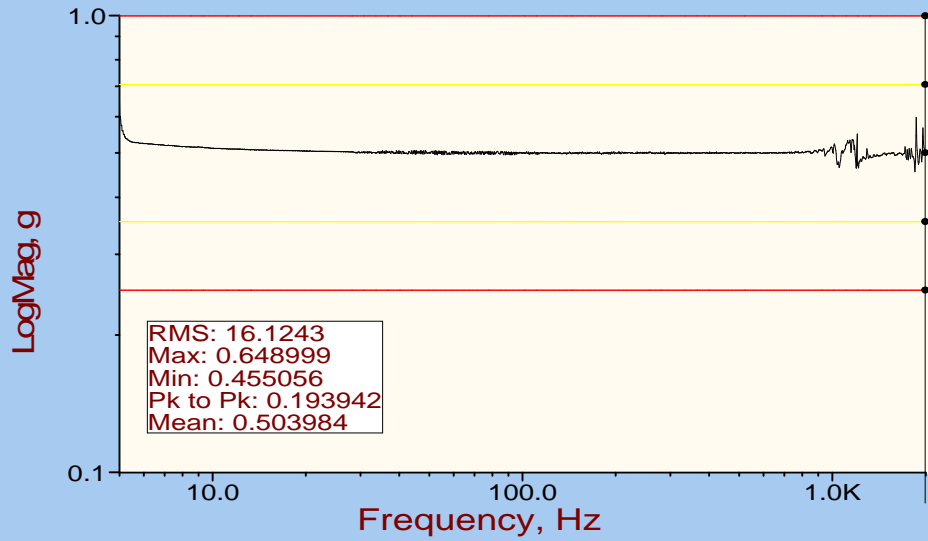
### TOP CORNER BAFFLES X AXIS



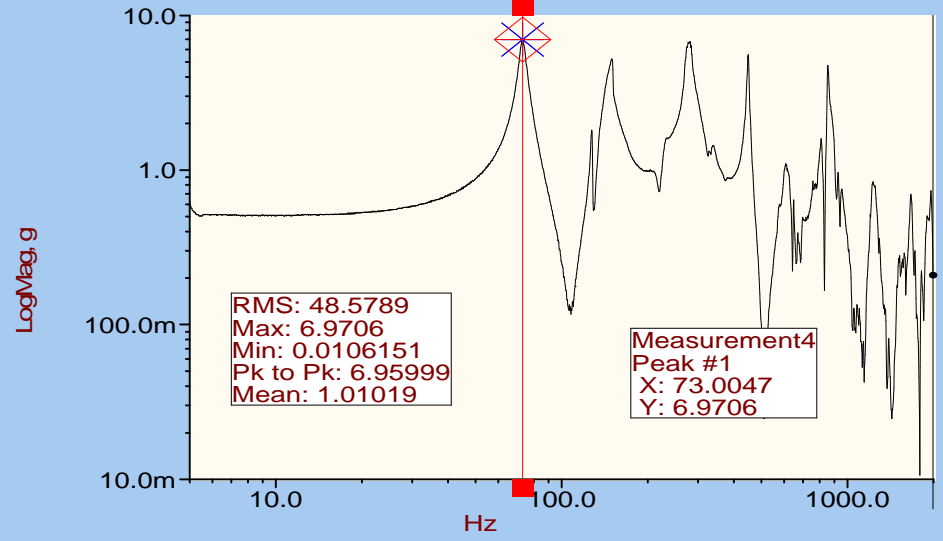
SMEI FM3 CAMERA RANDOM  
RUN 00003  
X AXIS  
11:28:50 05/01/2001

FIG 11b

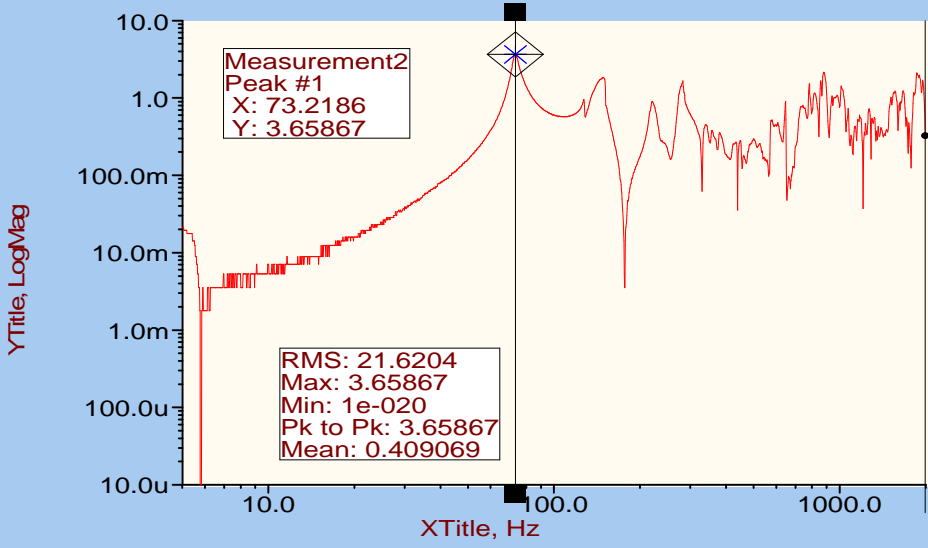
### Control;AlarmLow;AlarmHigh;AbortLow;Abo



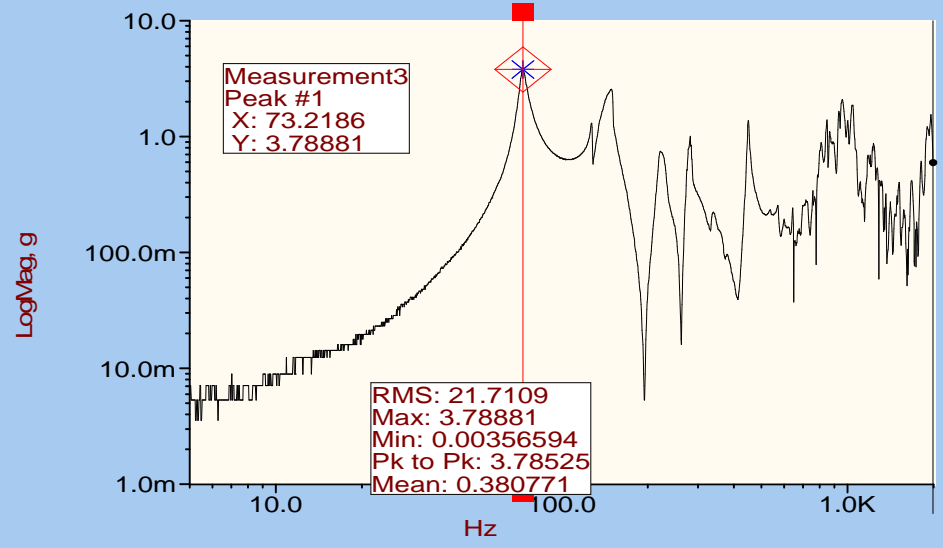
### TOP CORNER RADIATOR X AXIS



### TOP CORNER RADIATOR Y AXIS



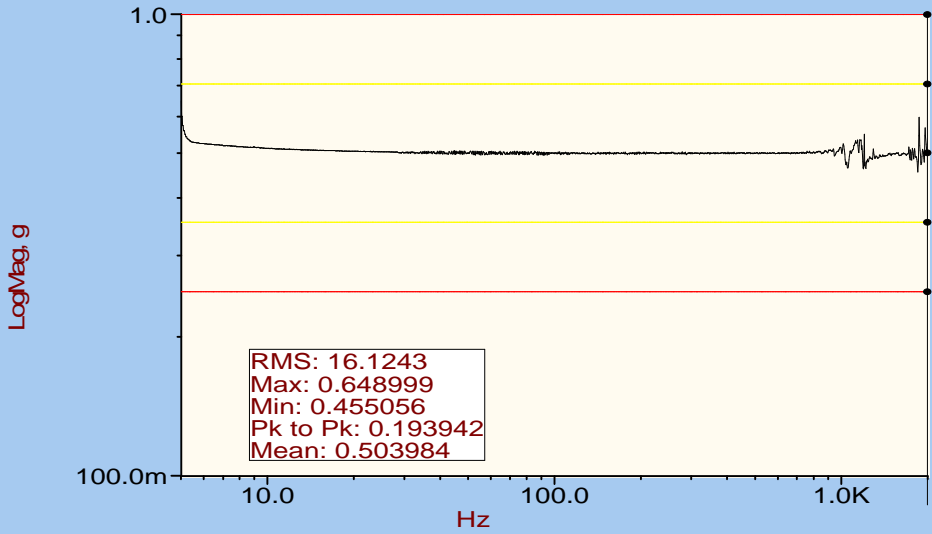
### TOP CORNER RADIATOR Z AXIS



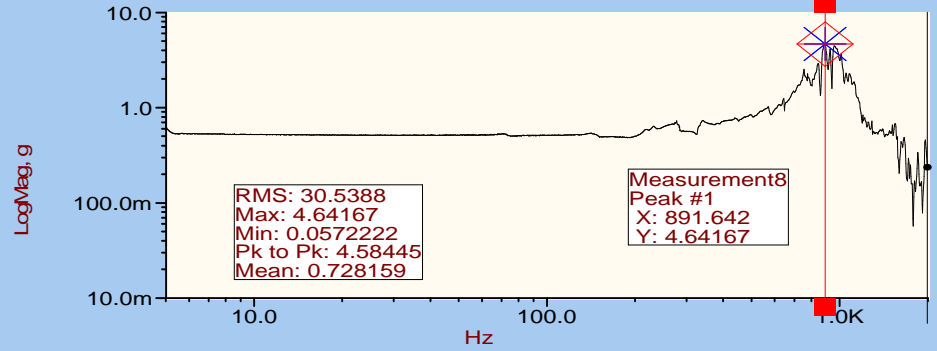
SMEI FM3 CAMERA POST RANDOM SINE SURVEY  
RUN 00006  
X AXIS  
11:31:46 05/01/2001

FIG 12a

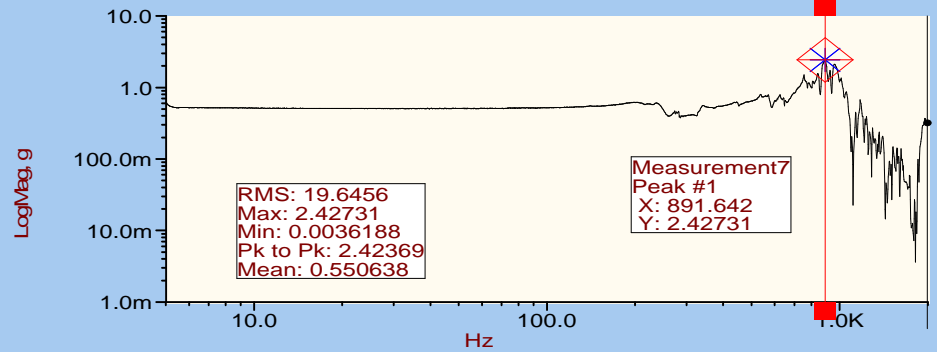
### Control;AlarmLow;AlarmHigh;AbortLow;Abo



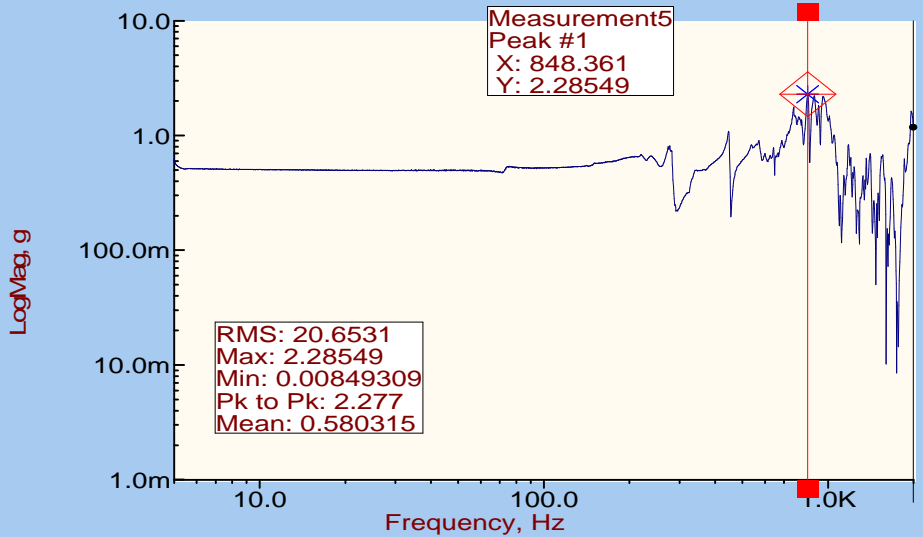
### REAR TOP CORNER E BOX X AXIS



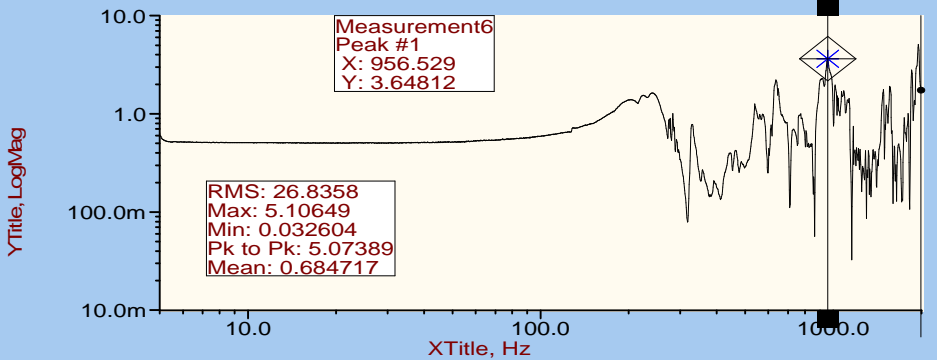
### REAR END BAFFLE X AXIS



### TOP END COLD FINGER X AXIS



### TOP CORNER BAFFLE X AXIS



SMEI FM3 CAMERA POST RANDOM SINE SURVEY  
 RUN 00006  
 X AXIS  
 11:31:46 05/01/2001

FIG 12b