LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY
- LIGO -
CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Document Type **LIGO-T980136-00 - L**
Initial environmental data from the Livingston facilities
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Contents

LVEA Data (All data taken :a) HVAC on, b) chiller off, c) HVAC off)

Table 1: Instruments

instrument	*manufacture*	*freq range*	*bandwidth*	*sensitivity*
		Hz	*Hz*	
Magnetometer	Heath Co Coil 3400 turns, 10.5 cm D 62.5 ohms Gain 100 Stanford 560	0 - 400	3K	(0.54/f) gauss /volt $(5.4 \times 10^{-9}$ /f) gauss/$\sqrt{Hz}$
Microphone	Radio Shack Level Meter	20 - 10K		4.8×10^{-1} dynes/cm^2 /volt on 60 db scale
Accelerometer	Wilcoxon Research	0.1 - 450 Hz	450	1.0×10^{-3} g /volt (amp.) 2.0×10^{-11}g/$\sqrt{Hz}$
Seismometer	Guralp CMG-40T	0.1 - 100		2.5×10^{-1} cm/sec/volt
Tilt meter	Applied Geomechanics 520	0 - 4	4	2×10^{-6} radians/volt

Spectrum Analyser

Hewlett Packard 35670A ; Input noise 3×10^{-7} volts / $\sqrt{Hz}$

NOTE: Spectrum analyser used with a Stanford amplifier with 3×10^{-9} volts / $\sqrt{Hz}$ at input to bring the analyser noise to below the level of the transducer noise when needed

Table 2: Frequency scan and bandwidth using Hanning window

range	*bandwidth*
0 - 1.6 Hz	0.00586 Hz
0 - 25	0.09375
0 - 400	1.5

Location of the Measurements

Lvea: All the instruments were placed on the floor next to the vertex chamber. The magnetometer coils were placed on the floor. The microphone was held on a tripod 50 cm above the floor. The horizontal seismometer output was the N/S direction aligned with the y arm. The acceloreme-

ter horizontal direction is aligned with the y arm. The x tilt is a rotation in a plane containing the x arm and the y tilt is a rotation in a plane containing the y arm.

Time and Conditions during the Measurement

The measurements were made in the late afternoon and evening of December 17, 1998 under low wind conditions (< 5 MPH) and clear skies.

MISSING SUMMARY AND RECOMMENDATIONS

a) Livingston site shows less noise from chillers than the Hanford site

b) The noise from the HVAC is comparable with Hanford.

c) The seismic and tilt noise below 10 Hz is larger at Livingston

d) The seismic and acceleration noise above 10Hz is smaller at Livingston

e) Does the site make the LIGO specification?

f) What is the noise in the buildings other than the LVEA?

NOTE: All the figures are composed of data from three states of the LVEA
HVAC on = solid lines
Chiller yard off = dots
HVAC off = dots/dashes

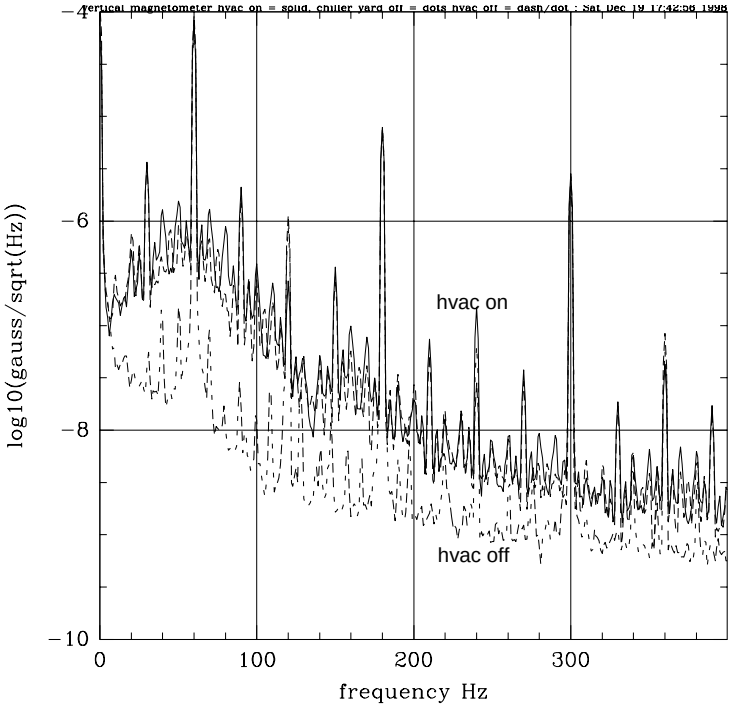

Figure 1: Vertical magnetic field in the LVEA

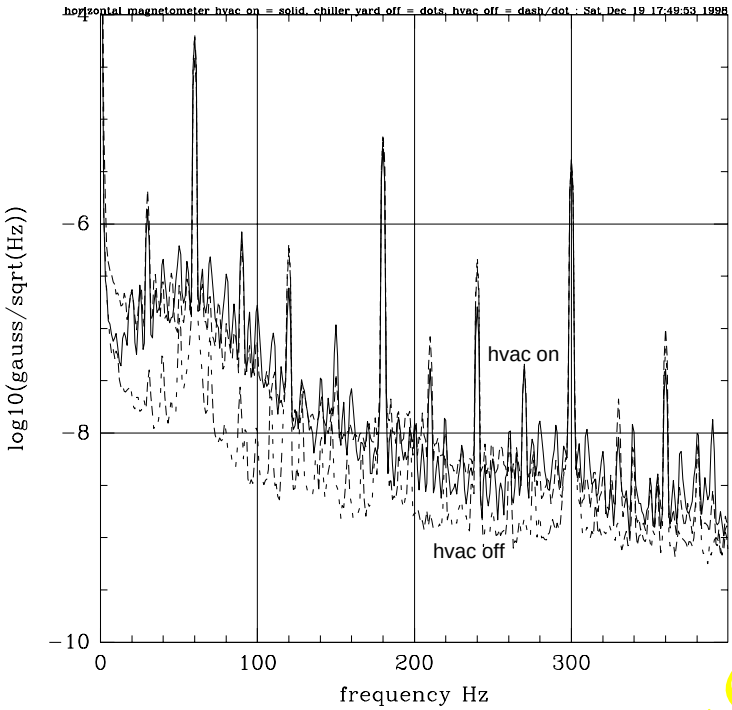

Figure 2 Horizontal magnetic field in the LVEA

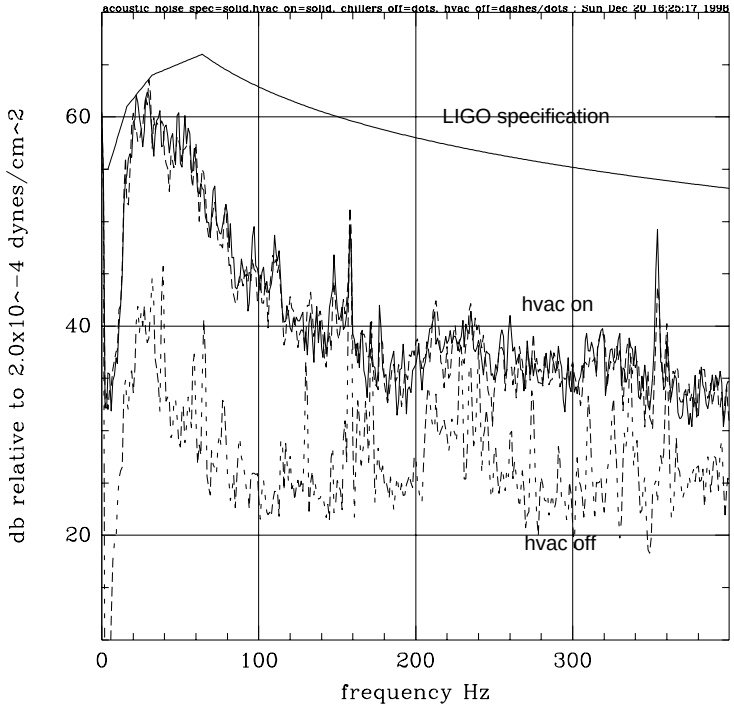

Figure 3 Acoustic field in the LVEA 50 cm above the floor

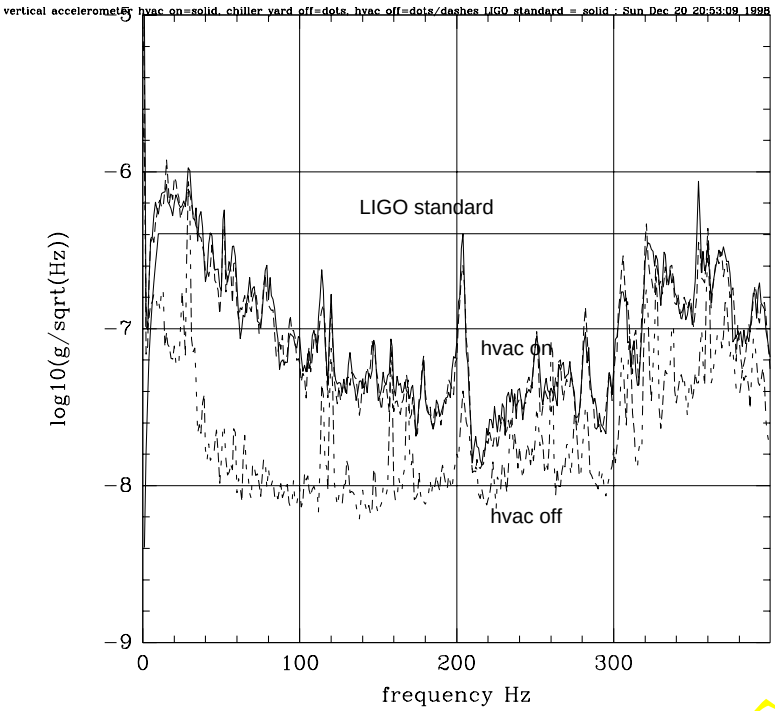

Figure 4 Vertical acceleration in the LVEA

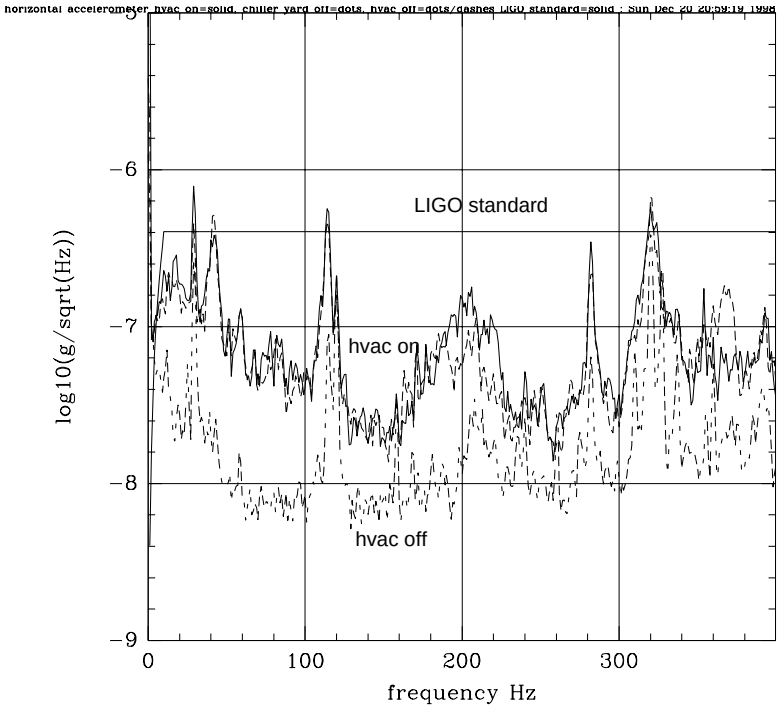

Figure 5 Horizontal acceleration in LVEA

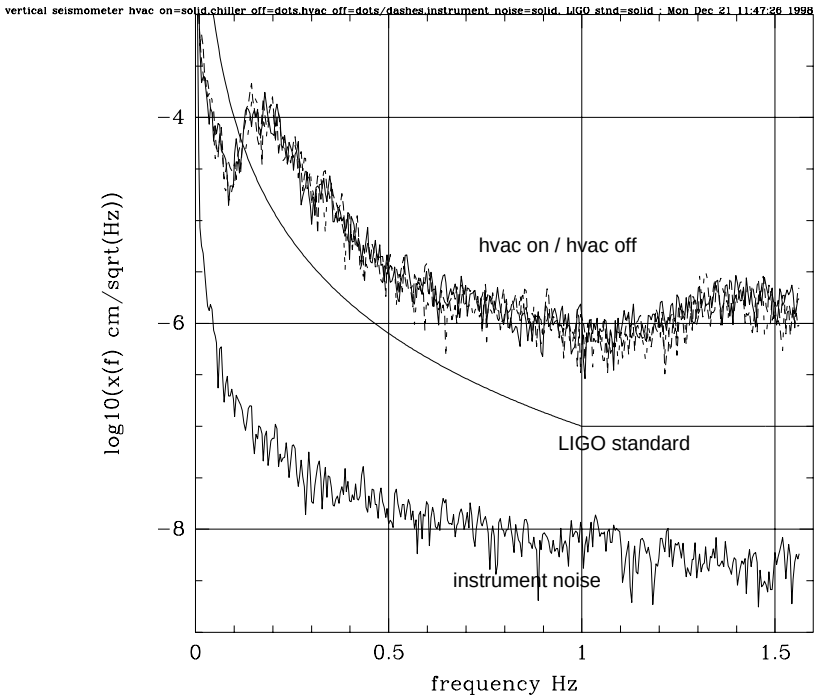

Figure 6 Vertical seismometer displacement in LVEA

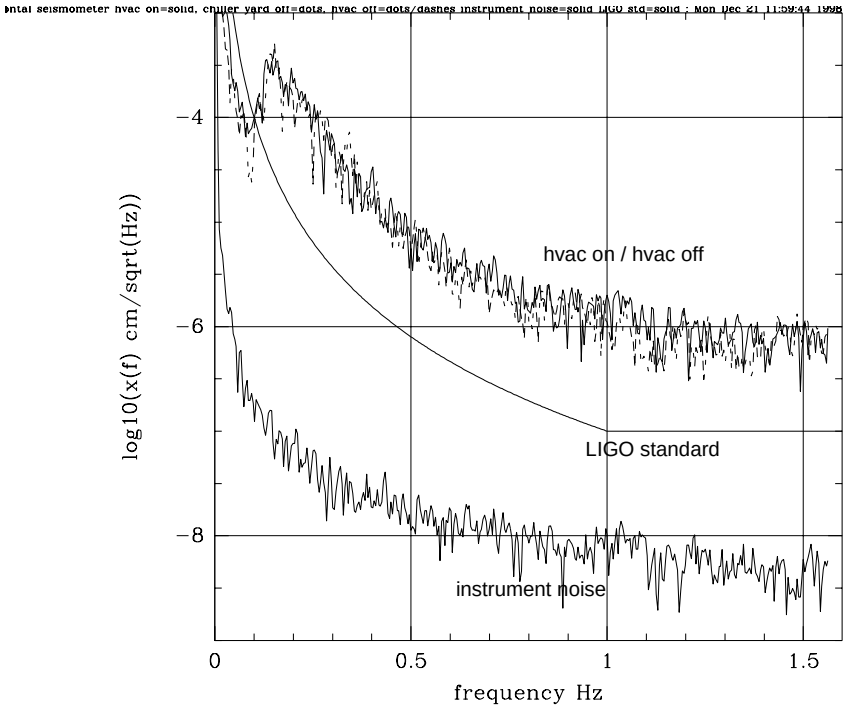

Figure 7 Horizontal seismometer displacement in LVEA

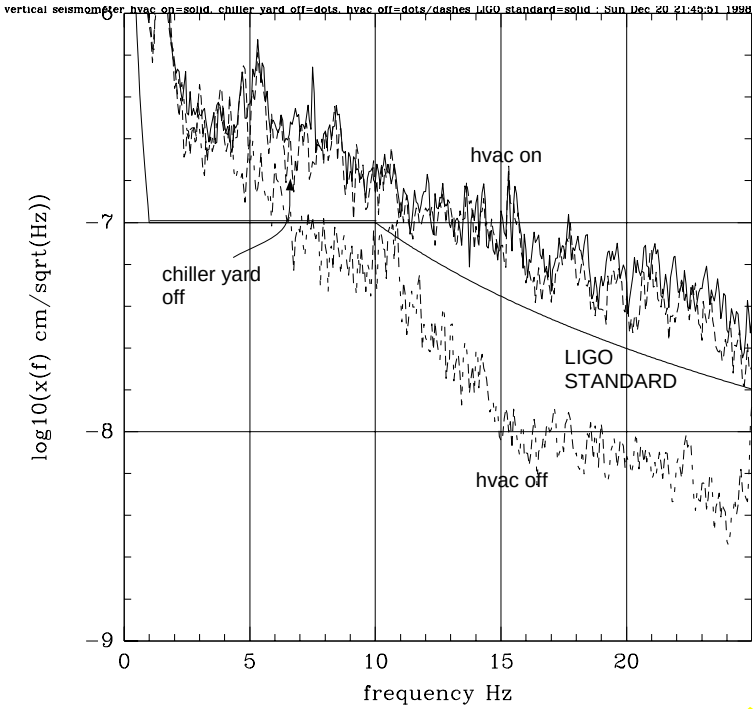

Figure 8 Vertical seismometer displacement in LVEA

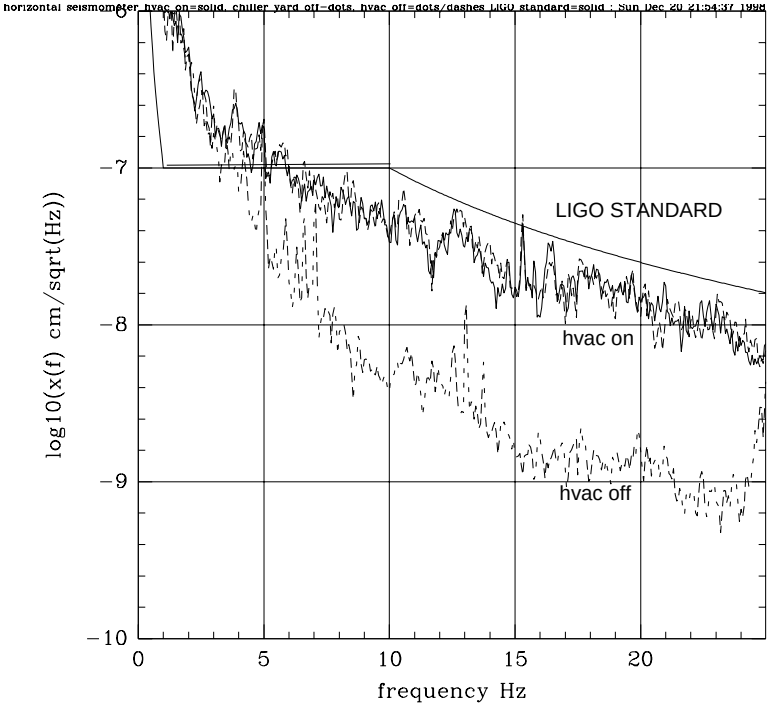

Figure 9 Horizontal seismometer displacement in LVEA

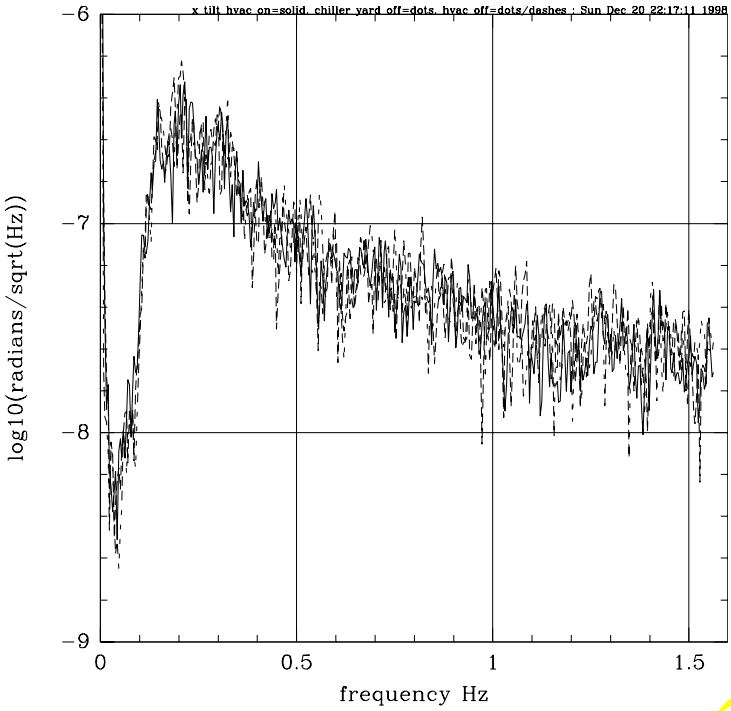

Figure 10 x tilt in the LVEA

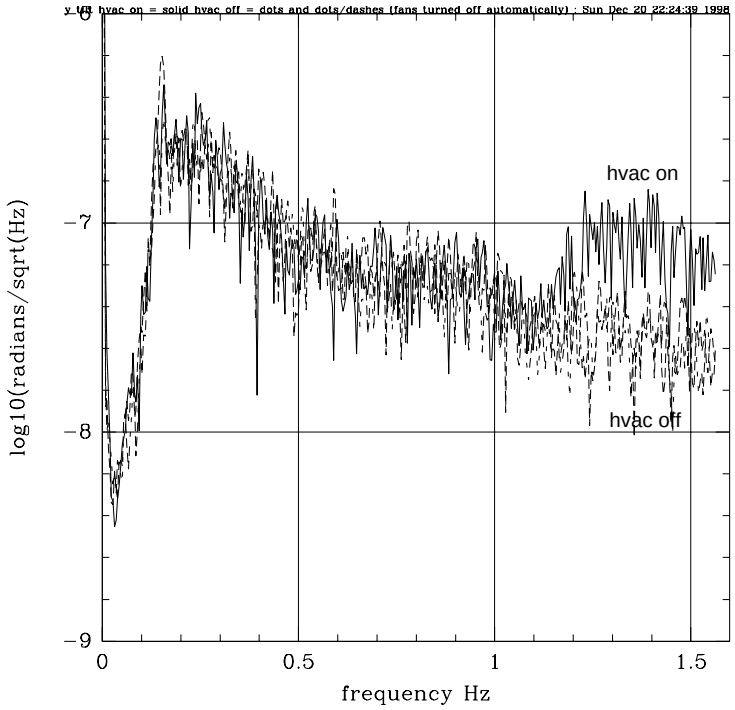

Figure 11 y tilt in the LVEA

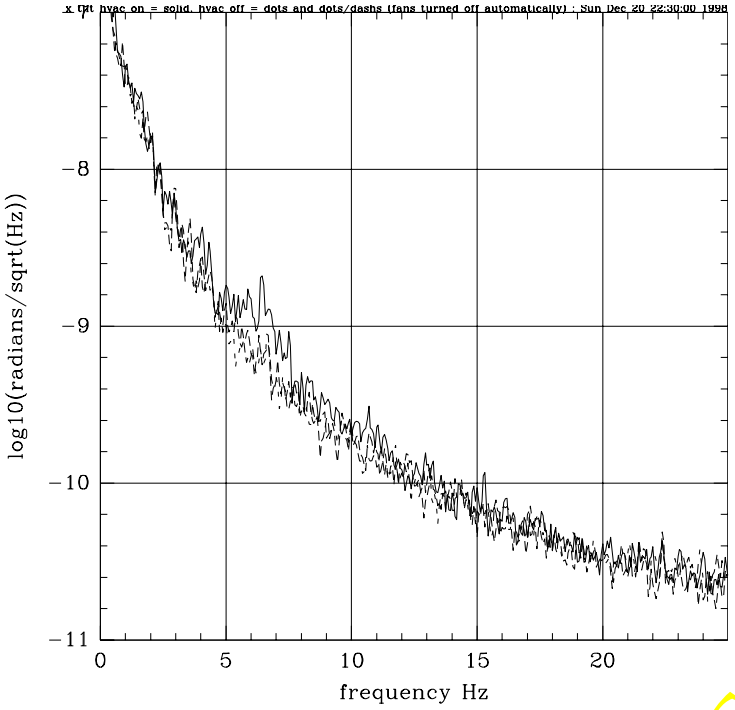

Figure 12 x tilt in the LVEA

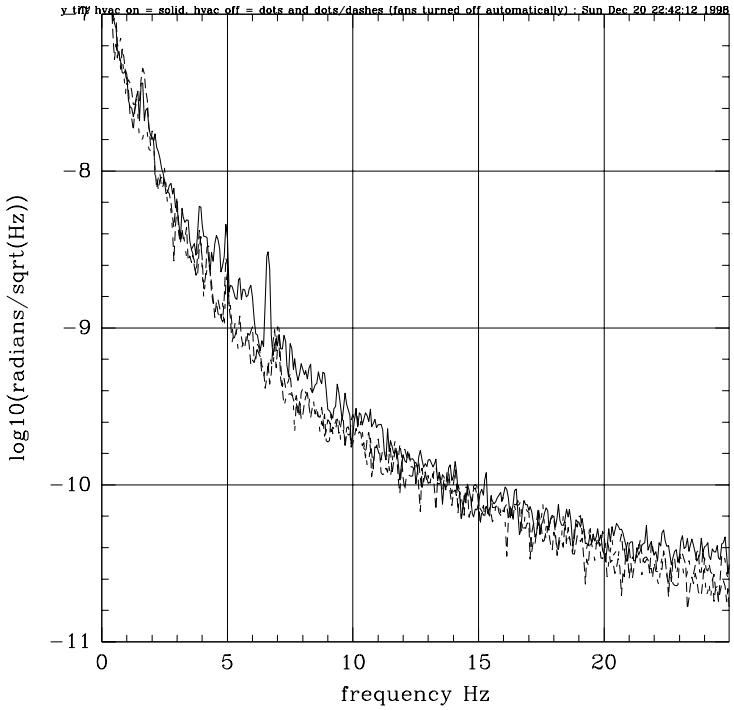

Figure 13 y tilt in the LVEA