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Tidal fits

- E2 results
- Oven model
- Tidal Fits

With help from Eli Boggart (High School Student)

LIGO-G010370-00-Z

E2 Review

- Select locks of at least 30 minutes and fit for a free offset for each lock period.

- Assume the tidal prediction (from Fred) is perfect and scale the data.

- Allow the common mode and differential mode signal to be a linear of combination of CARM and DARM.

Fit results:

common = 4.7 CARM + 0.8 DARM
diff   = 1.4 CARM + 5.1 DARM

Common Mode

Differential Mode
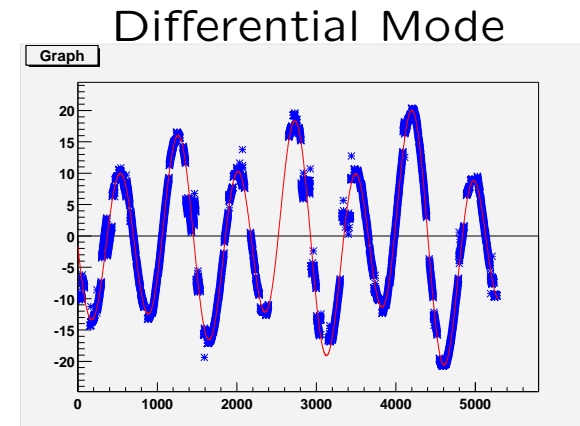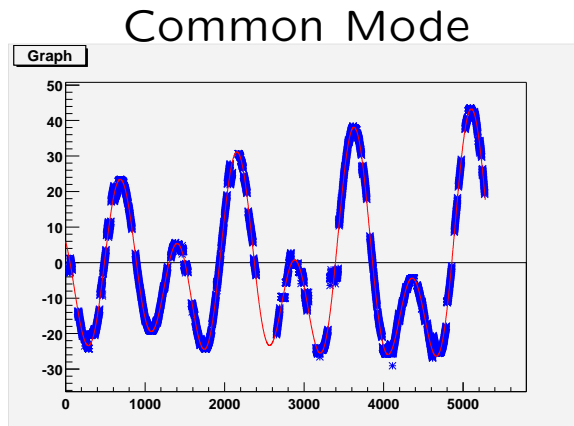
Time in minutes, displacement in microns

Official calibration
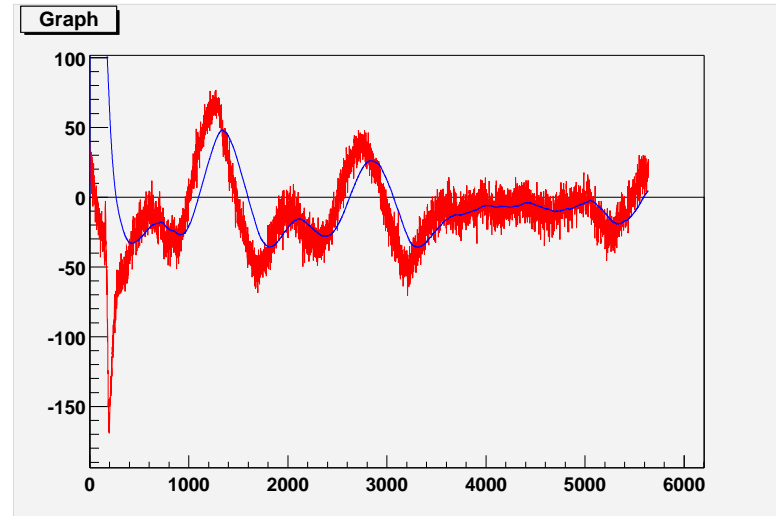
common = 6.5 CARM + 2.7 DARM
diff   = 2.7 CARM + 6.5 DARM

Temperature Model

Asumme that temperature in the reference cavity is given by

$$\Delta T_{in} = ((T_{out} - T_{in})C_1 + (T_{rm} - T_{in})C_2)\Delta t$$

where

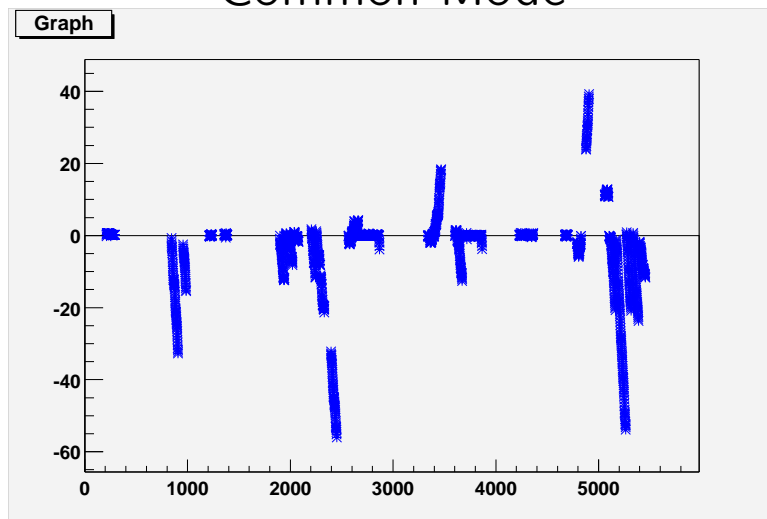|		
T_{in}	$=$	inside
T_{out}	$=$	outside oven (known)
T_{rm}	$=$	room
ΔT	$=$	time interval
C_1	$=$	1/142min (Hugh)
C_2	$=$	ϵC_1
ϵ	$=$	0 (to be varied)

Time in minutes (x-axis)
Relative temperature mK (y-axis)

Assume that change in inteferometer length is $\alpha(T_{in} - T_{in}^0)$

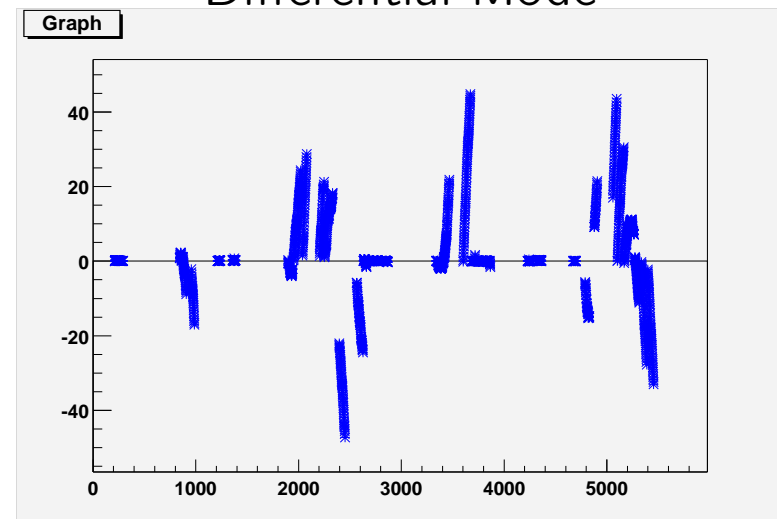Fit for α, expect $\alpha = 1\mu m/1mK$ for common mode

Selected Data

Select only locks of 30 minutes or more:

Common Mode

Differential Mode

Time in minutes (x-axis), displacement in microns (y-axis)
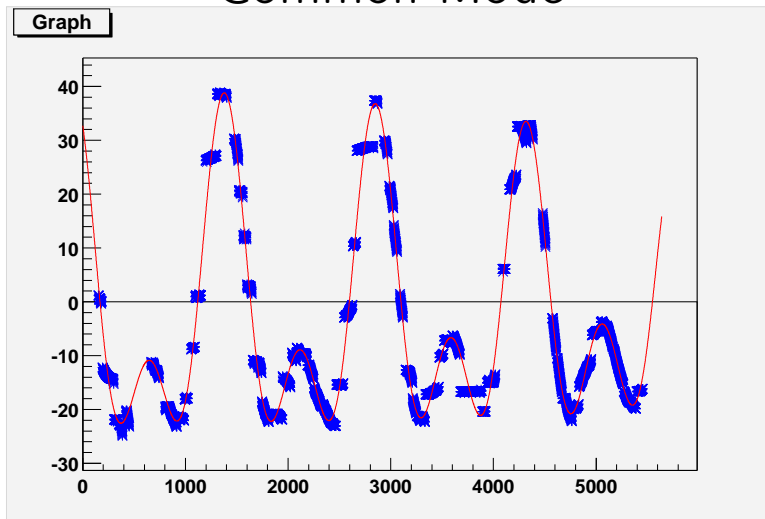
First try on e5 data very preliminary

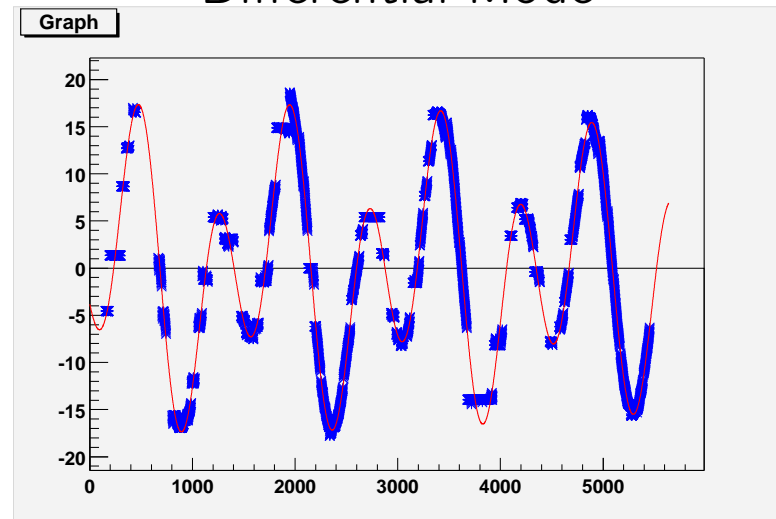## Includes light constraint on off diagonal terms

Fit results:

$$
\begin{aligned}
\text{common} &= -0.60 \text{ CARM} + -0.02 \text{ DARM} \\
\text{diff} &\simeq 0.04 \text{ CARM} + 0.95 \text{ DARM} \\
\alpha &= 0.04
\end{aligned}
$$

Common Mode

Differential Mode

Time in minutes (x-axis), displacement in microns (y-axis)

Plans

- Include only officially locked regions

- Add constraints on calibration

- Fit parameters of PSL oven (C_1 and C_2)