Lasti EPI

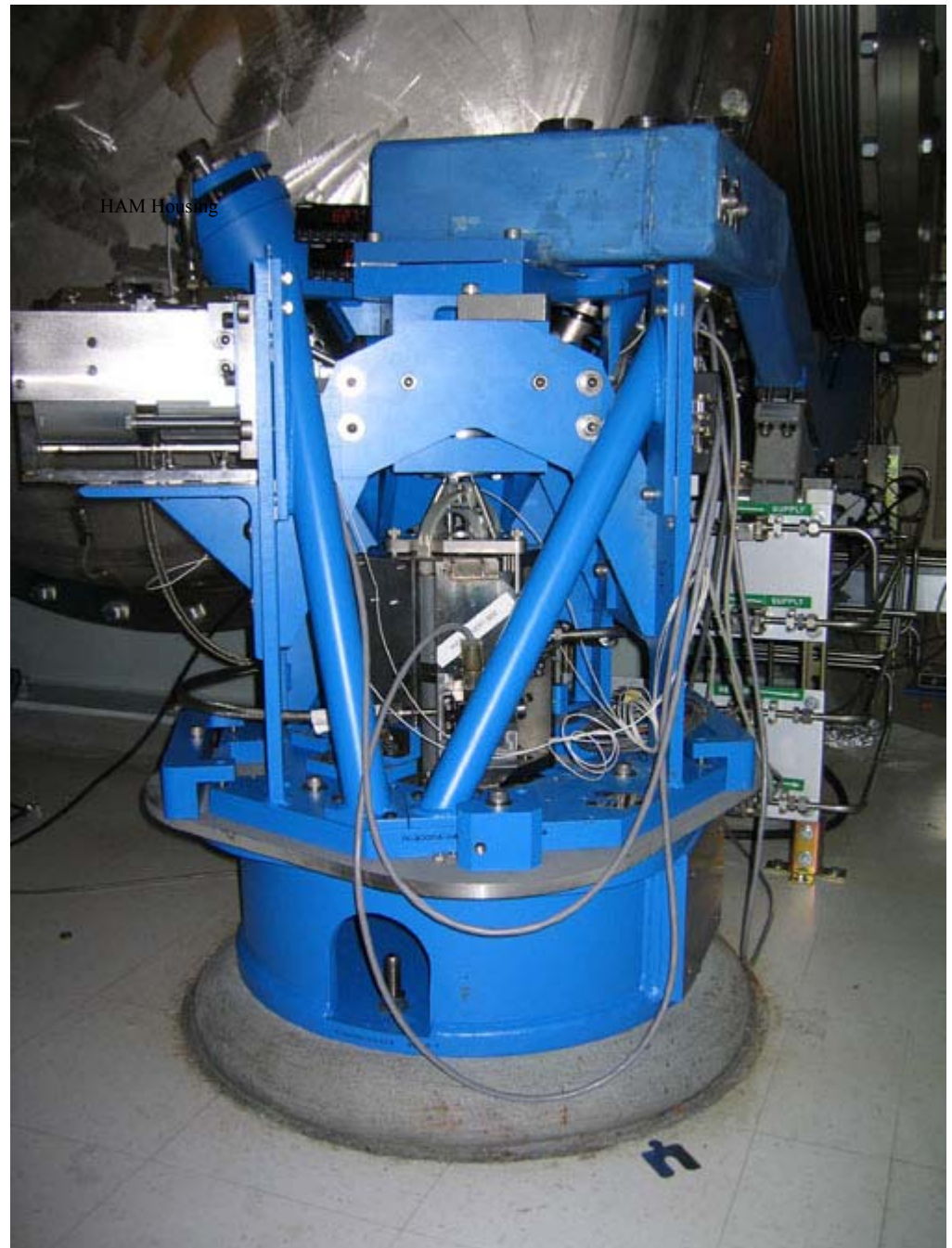## Way to many People to List

Presented by Richard Mittleman

BSC With EPI

HAM EPI Actuator Housing with HEPI Actuators

HAM Housing
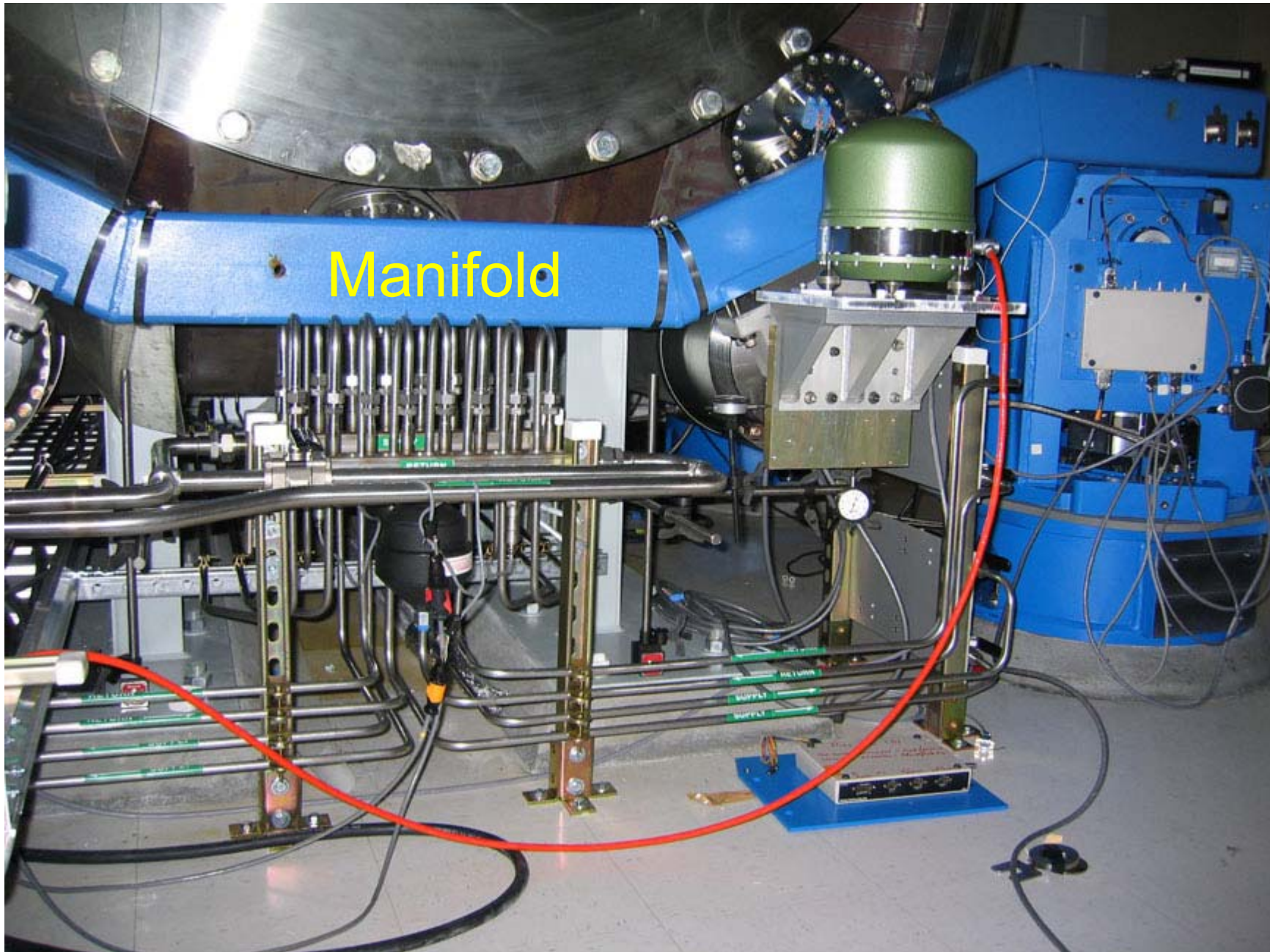
Ham Cross Beam
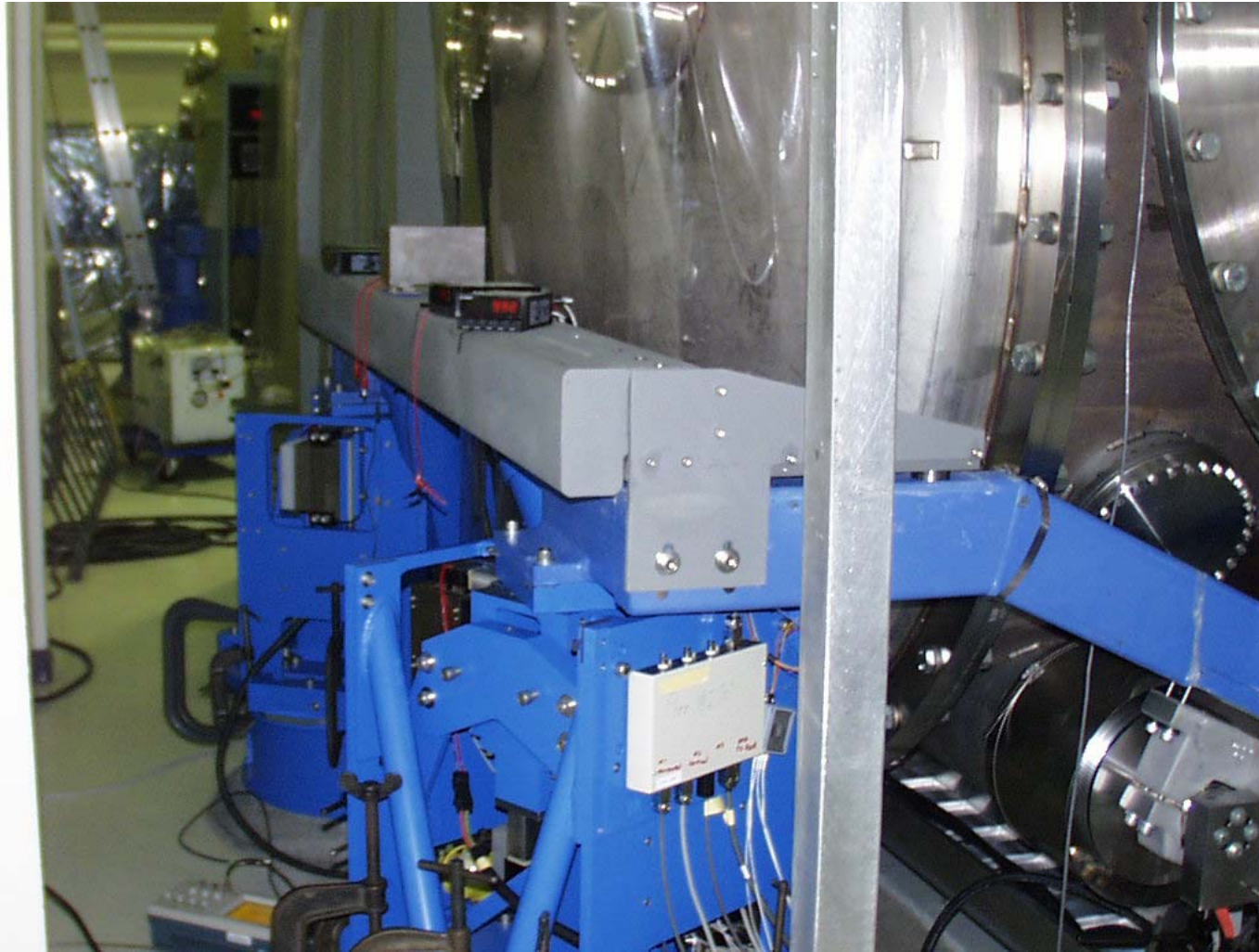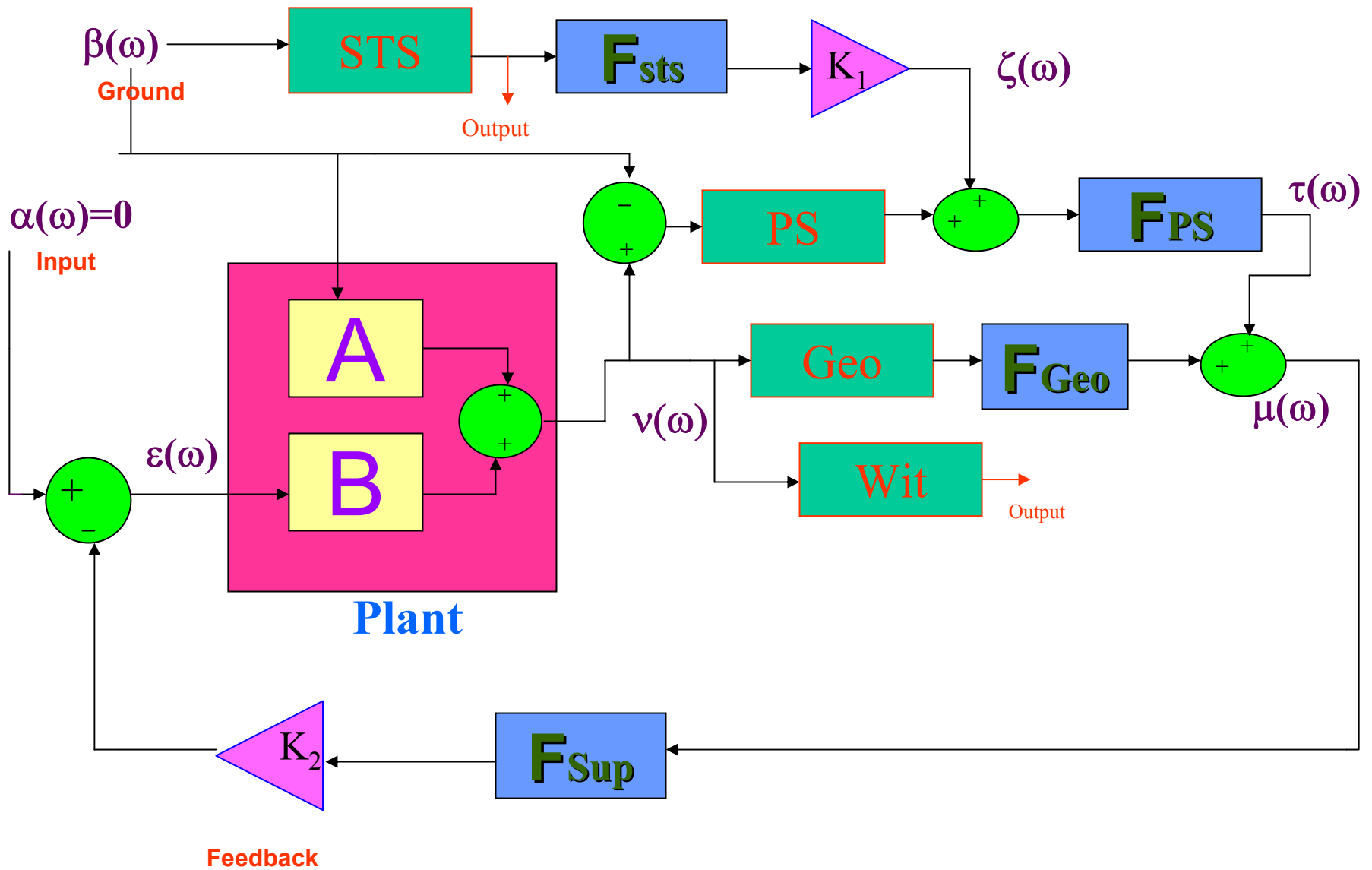
Manifold

LIGO-G030653-00-Z

Control Strategy

ZZ MODE BLENDING

LIGO-G030653-00-Z
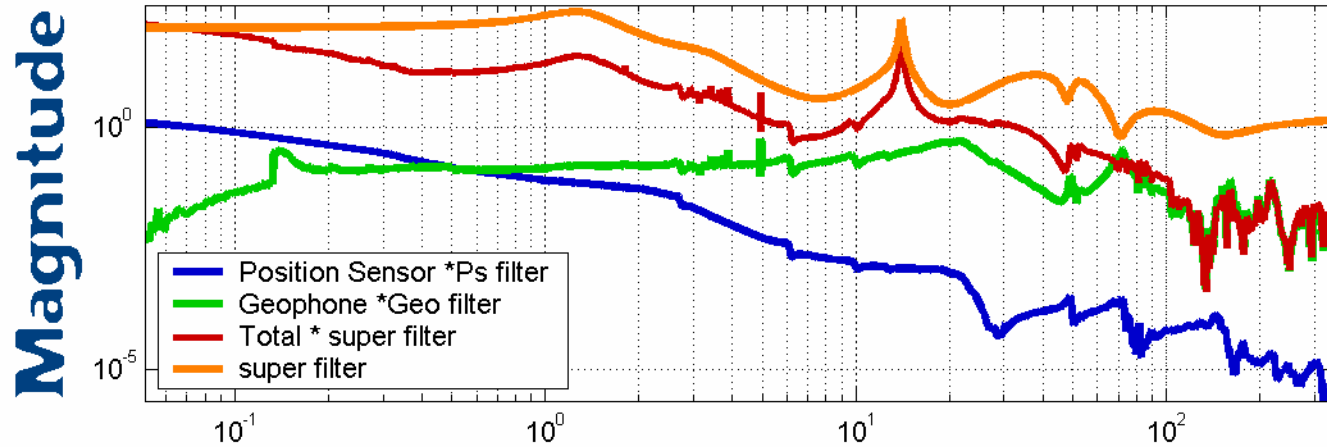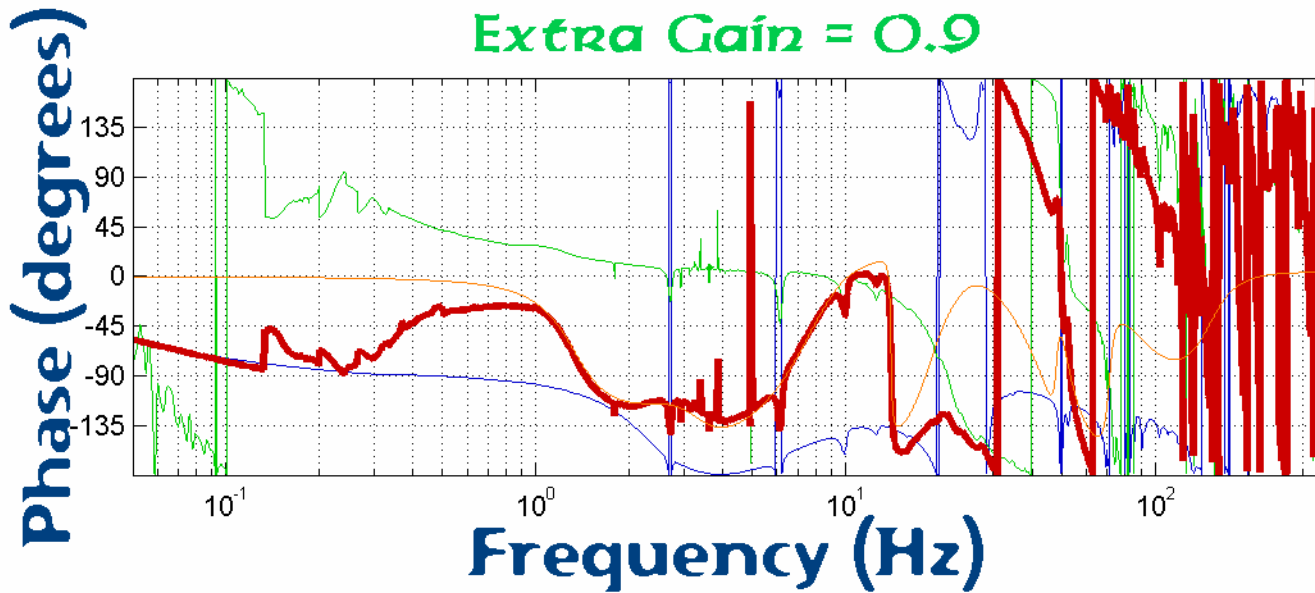
$$\chi_{PS} = PS \times B$$

Transfer Function from dSpace to Position Sensors

$$\chi_{Geo} = Geo \times B$$

Transfer Function from dSpace to Support Table Geophones

$$\chi_{\sup} = F_{Geo}\chi_{Geo} + F_{PS}\chi_{PS}$$

Open Loop transfer function

$$\widetilde{\chi}_W = A \times Wit \Big/ STS$$

Transfer Function from Ground STS to Witness Sensor

$$\chi_W = A \times Wit$$

Transfer Function from dSpace to Witness Sensor

$$\frac{\nu(\omega) \times Wit}{\beta(\omega) \times STS} = \frac{\widetilde{\chi}_w - K_2 F_{\sup} F_{PS} \times \left[K_1 F_{STS}\chi_{Wit} - \chi_{PS}\left(\dfrac{Wit}{STS}\right) \right]}{1 + K_2 \chi_{\sup}}$$

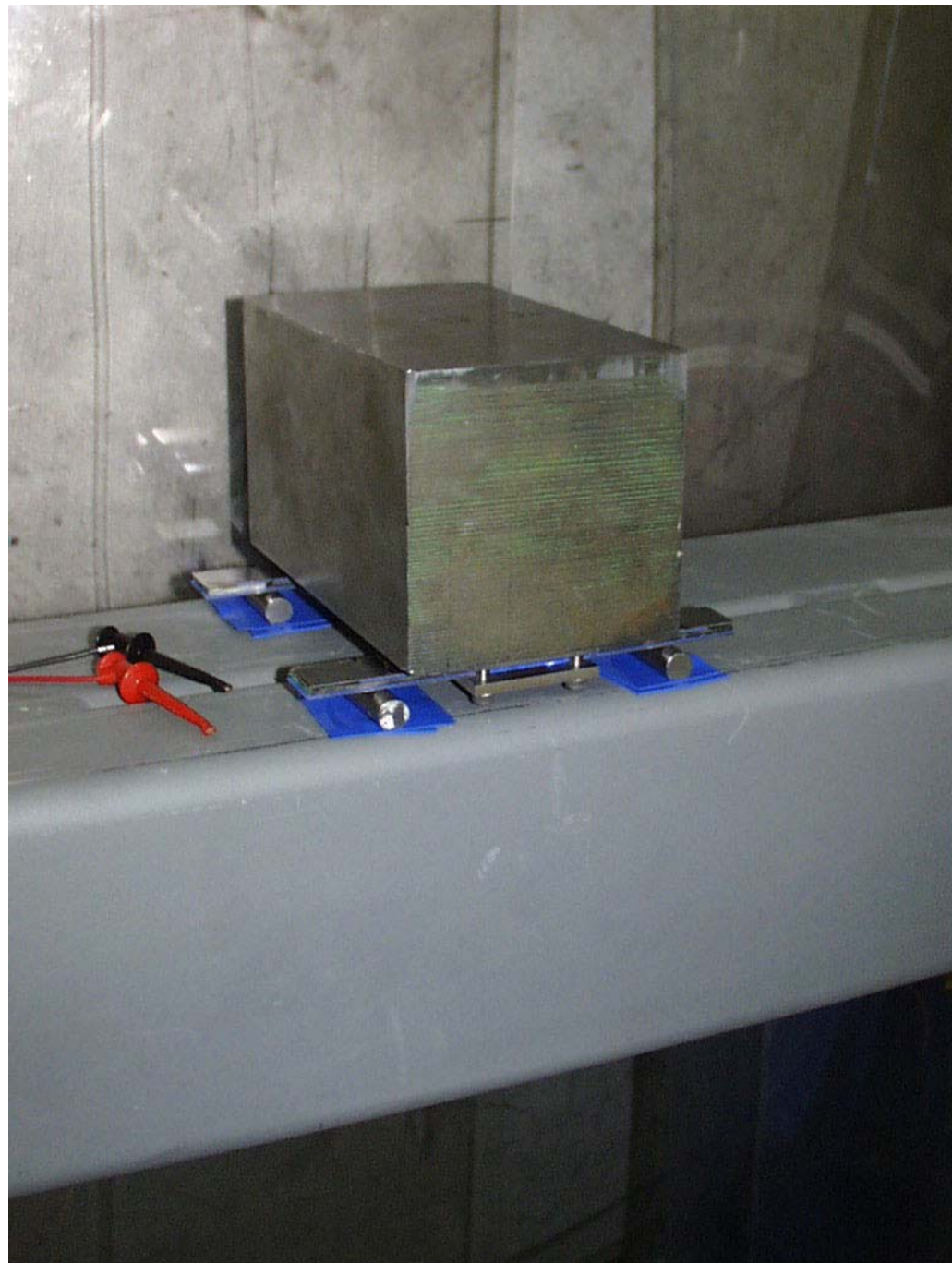**Closed Loop Transfer Function from ground to witness sensor**
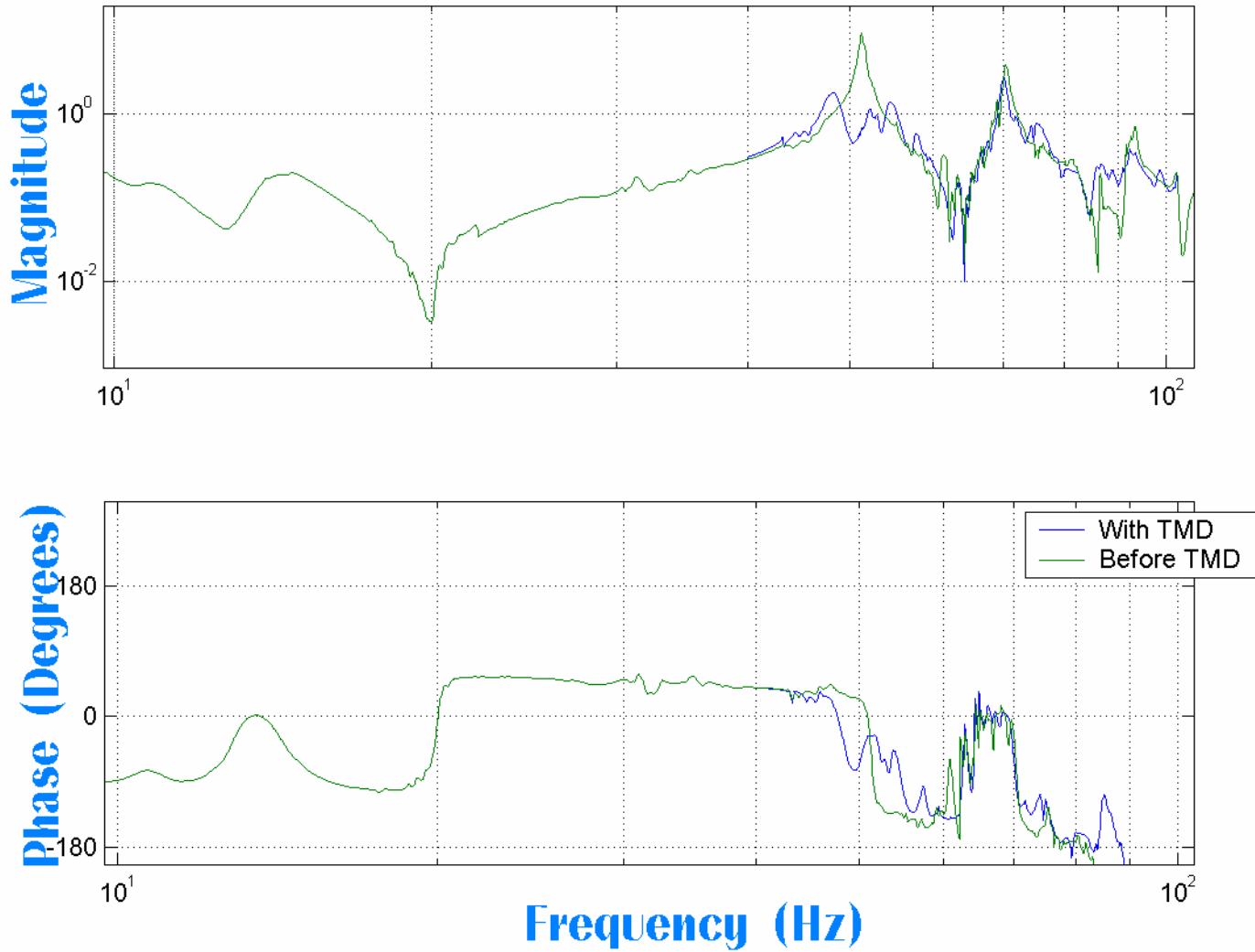
LIGO-G030653-00-Z

Tuned Mass Damper

Designed by
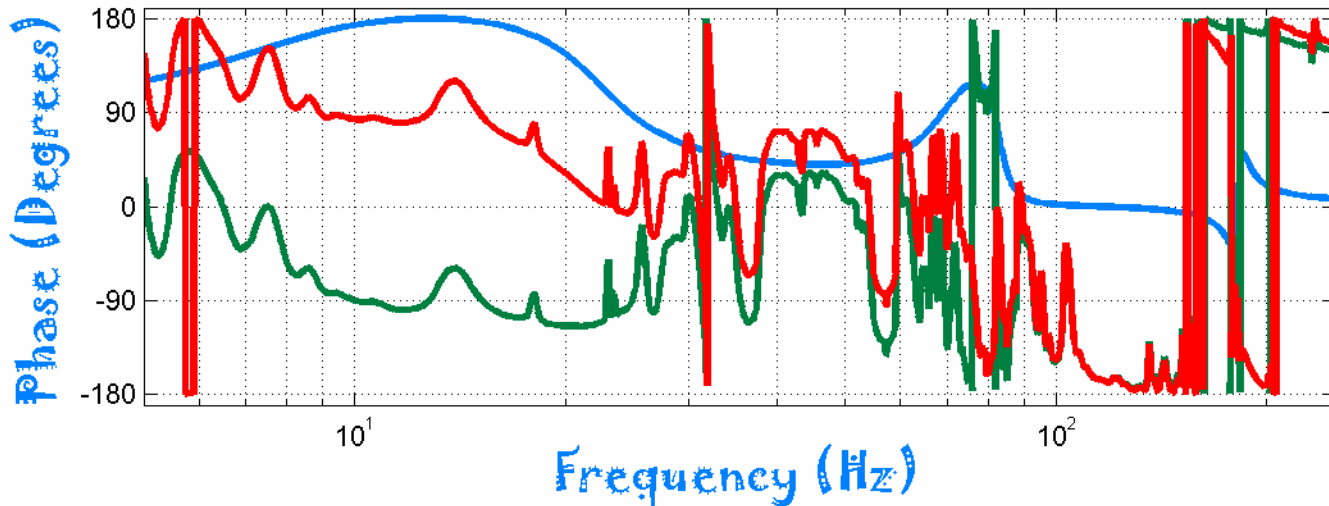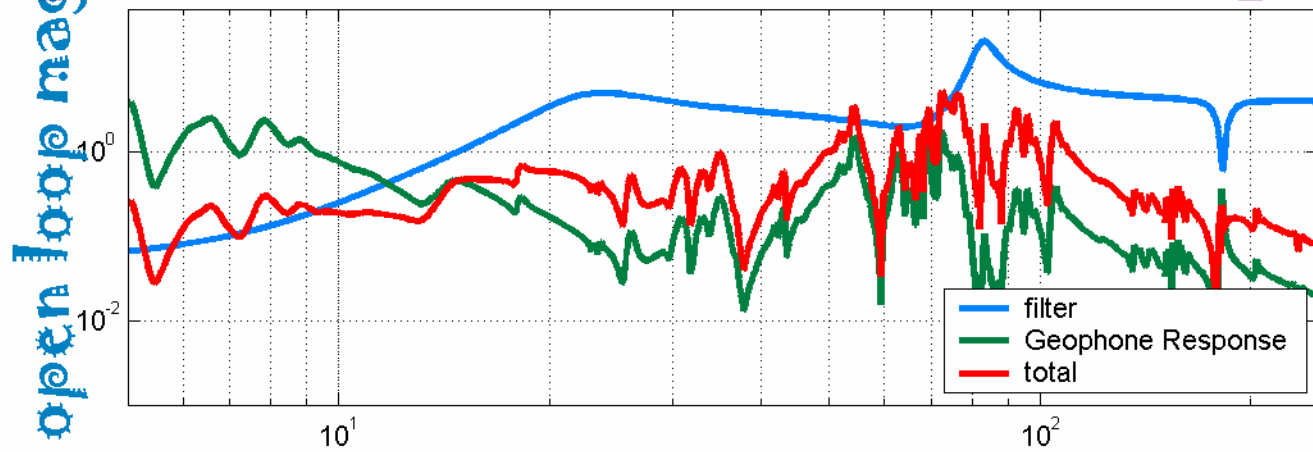Lei Zuo
MIT
Mechanical
Engineering
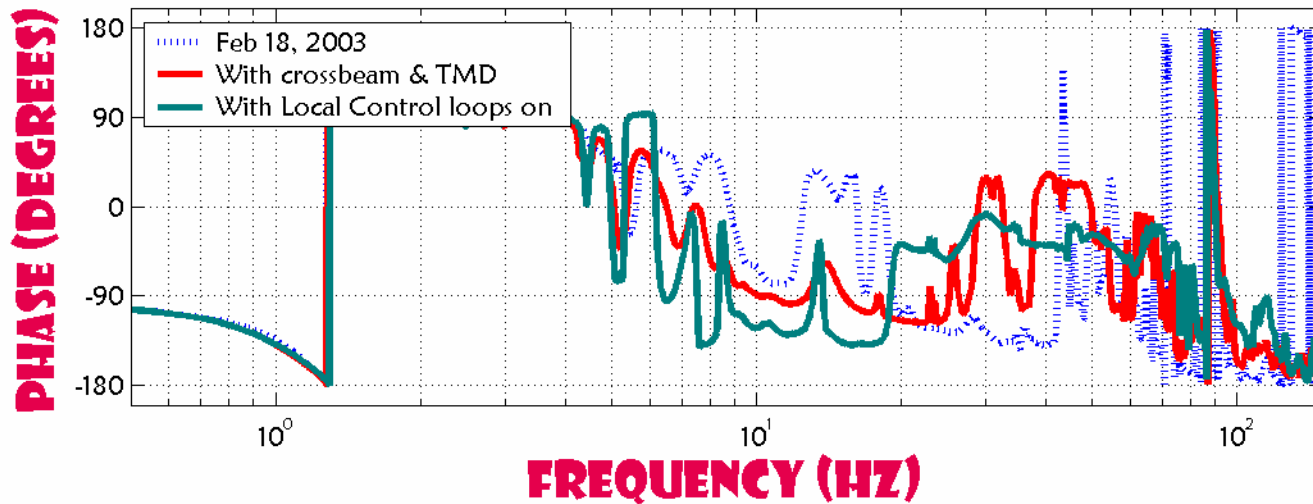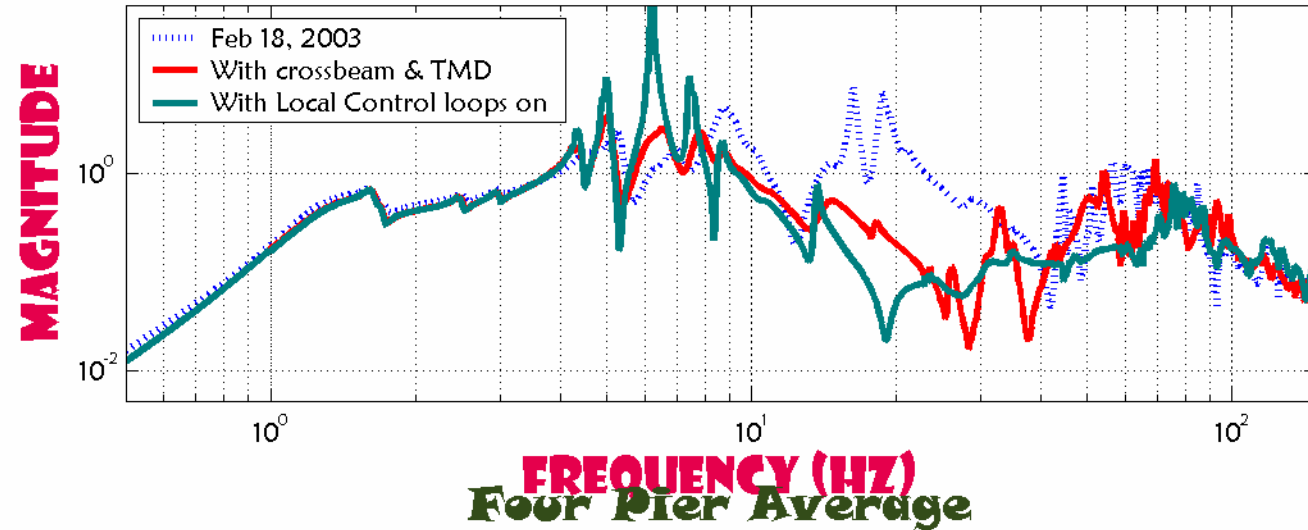Department

Y- (GEOPHONE) MODE PLANT MODIFCATIONS
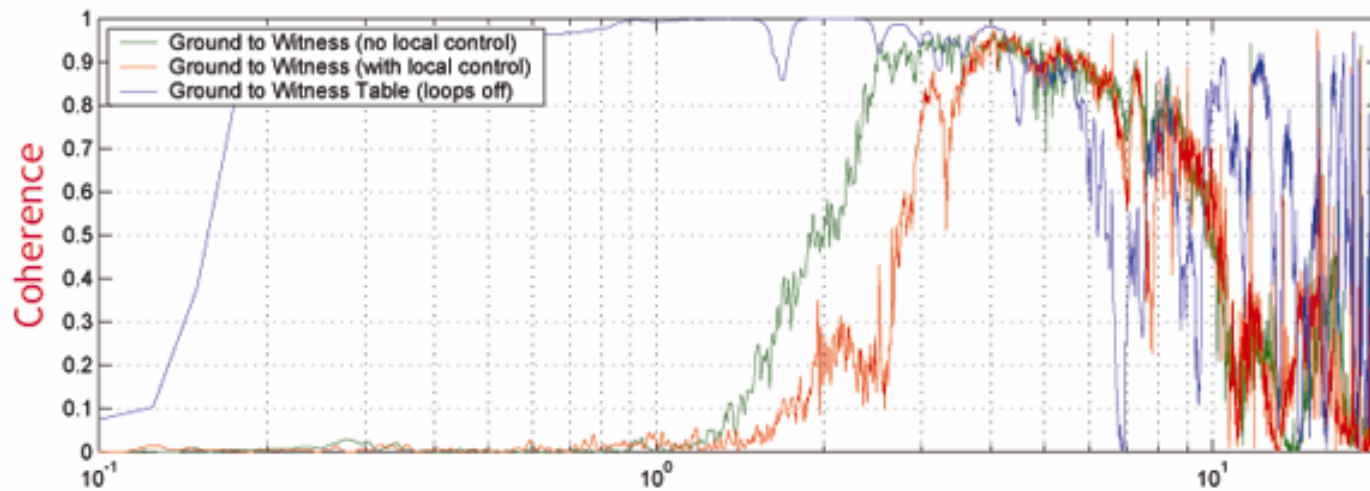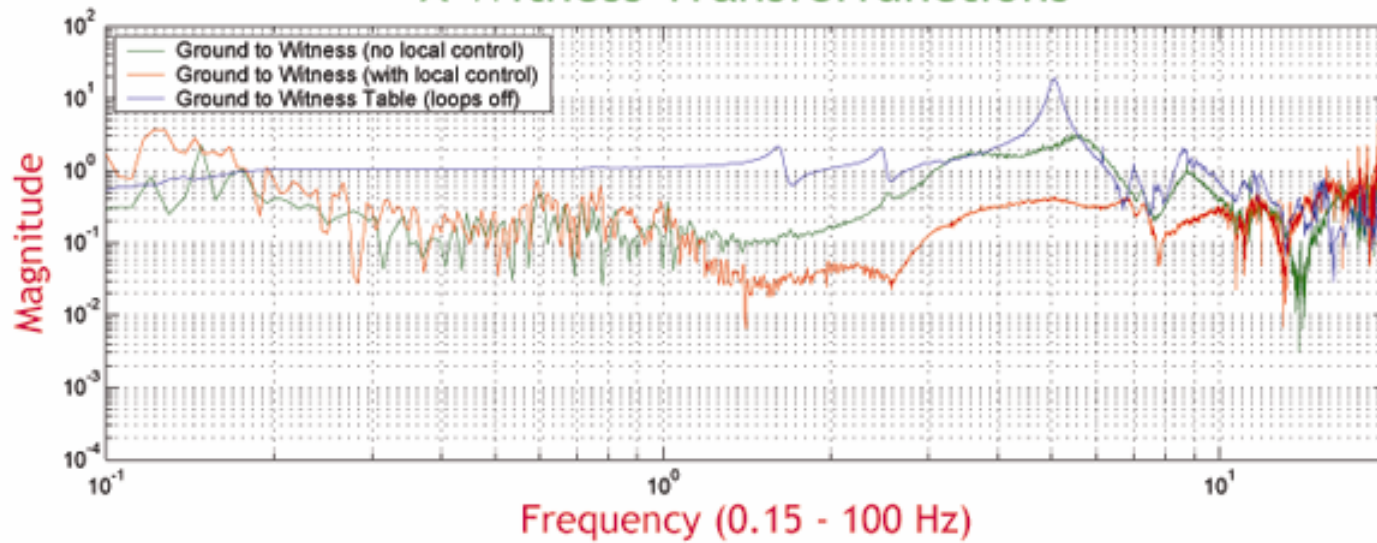
Local Control

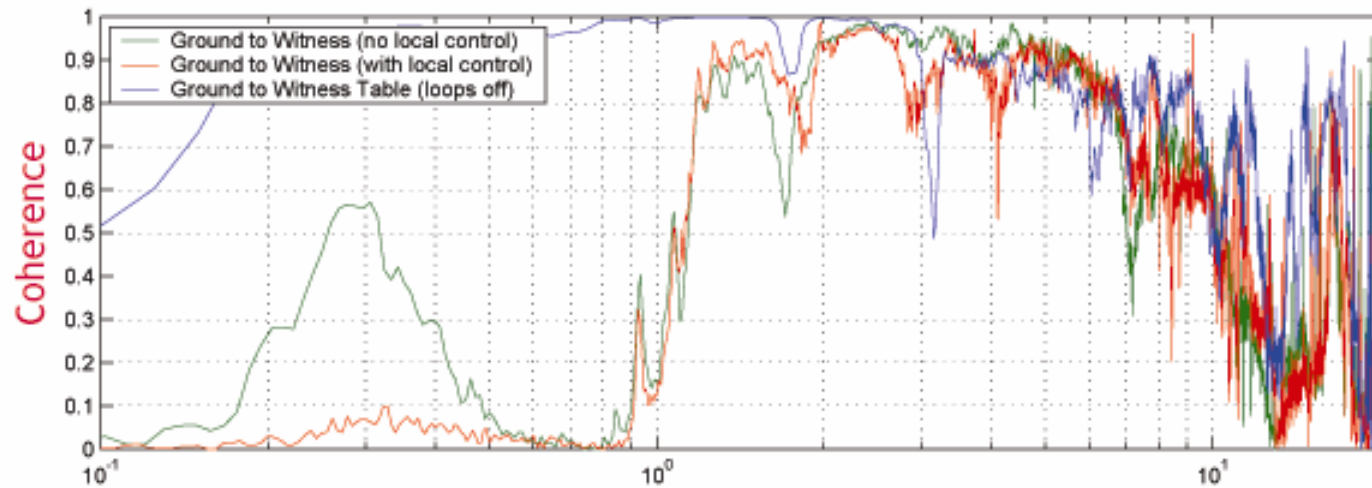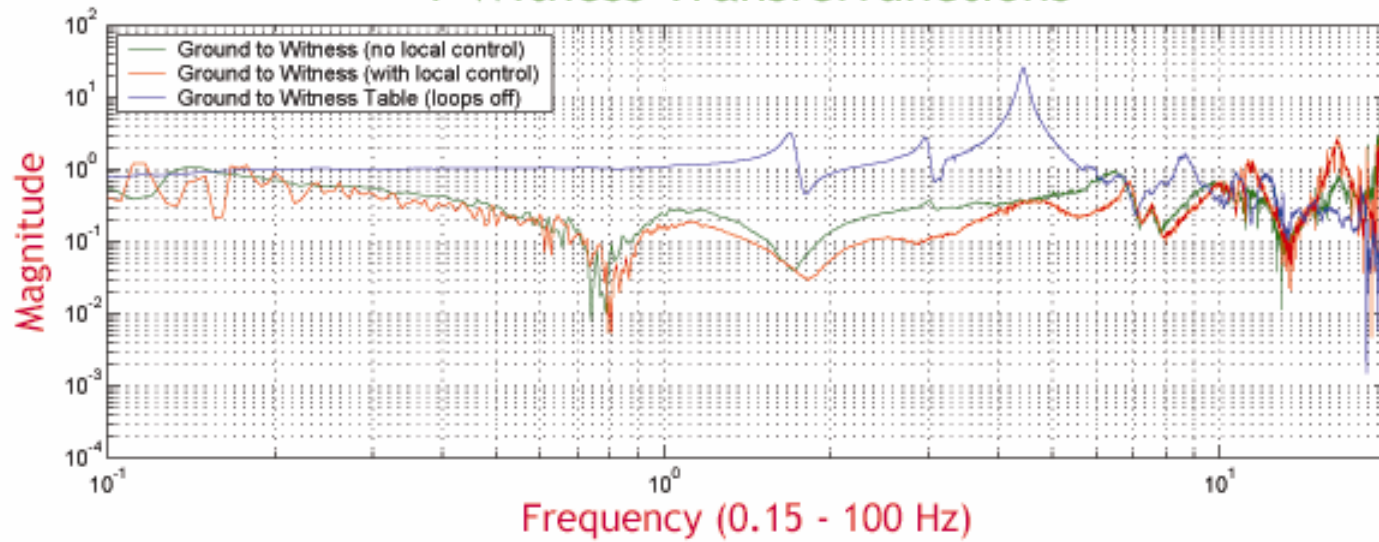Geophone Collocated H3 Local Loop Filter

MEPI-Collocated

Collocated Horizontal Transfer Functions

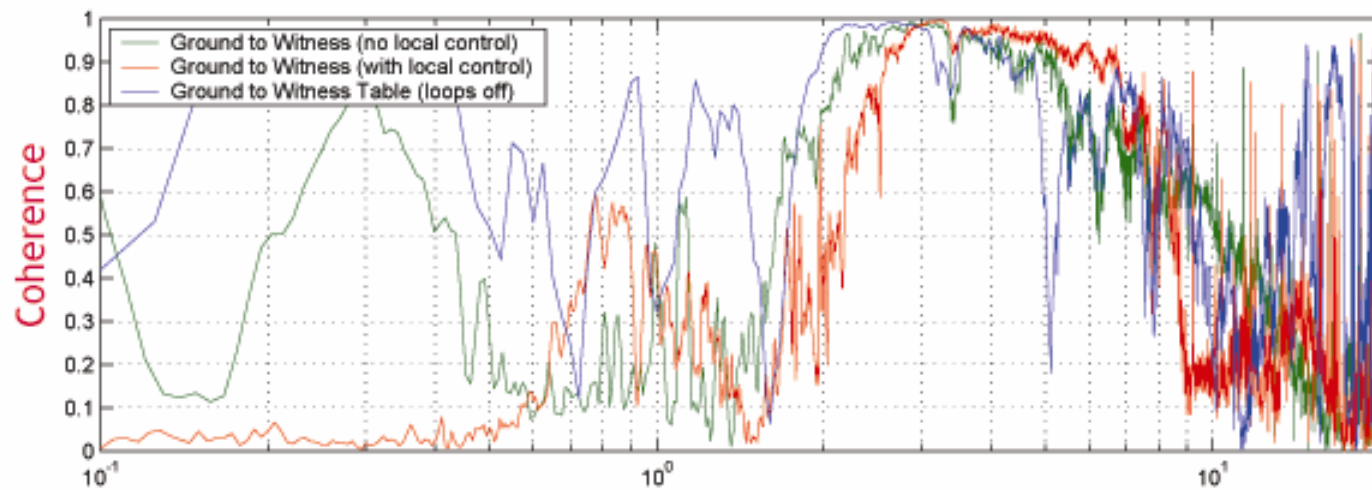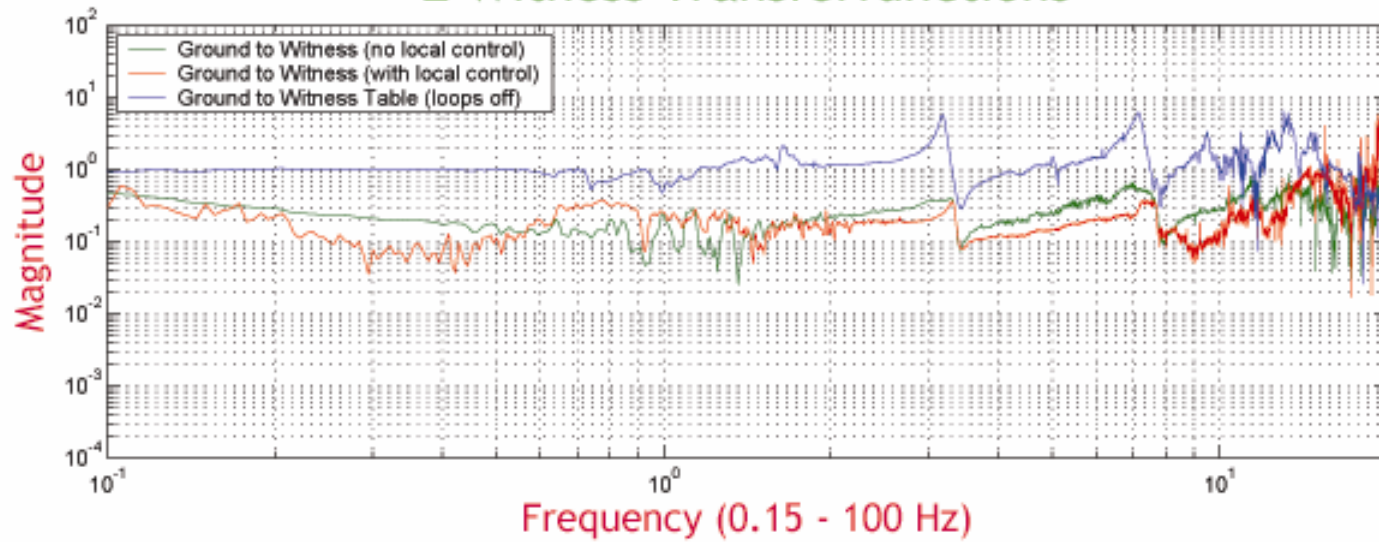Four Pier Average

LIGO-G030653-00-Z

X Witness Transferfunctions

Y Witness Transferfunctions

Magnitude vs **Frequency (0.15 - 100 Hz)**

Legend:
- Ground to Witness (no local control)
- Ground to Witness (with local control)
- Ground to Witness Table (loops off)

Coherence vs Frequency

Legend:
- Ground to Witness (no local control)
- Ground to Witness (with local control)
- Ground to Witness Table (loops off)

Z Witness Transferfunctions

Magnitude

- Ground to Witness (no local control)
- Ground to Witness (with local control)
- Ground to Witness Table (loops off)

Frequency (0.15 - 100 Hz)

Coherence

- Ground to Witness (no local control)
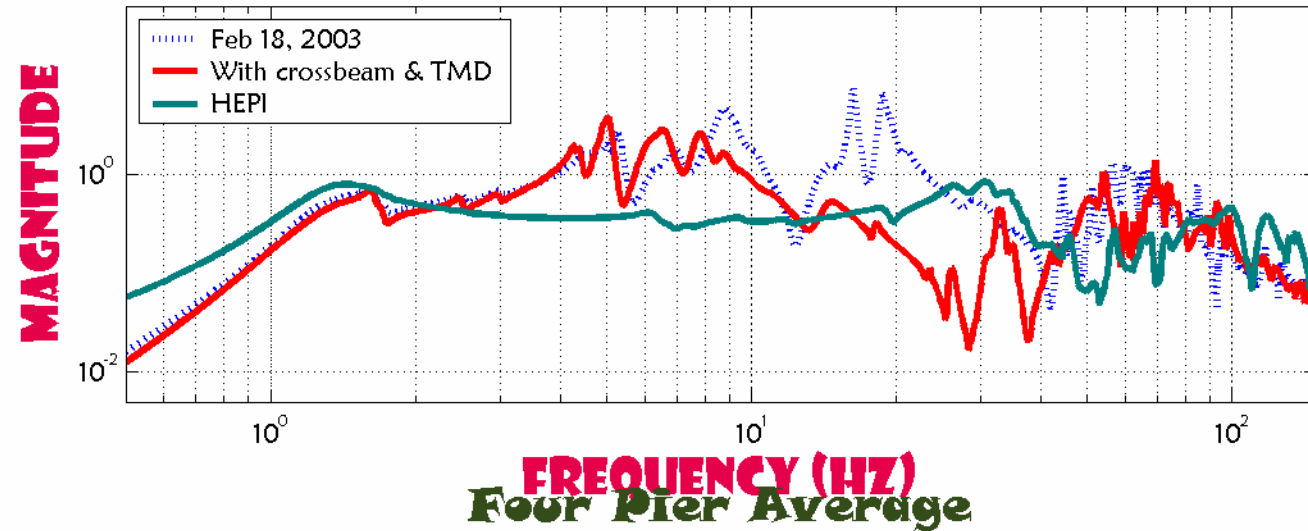- Ground to Witness (with local control)
- Ground to Witness Table (loops off)

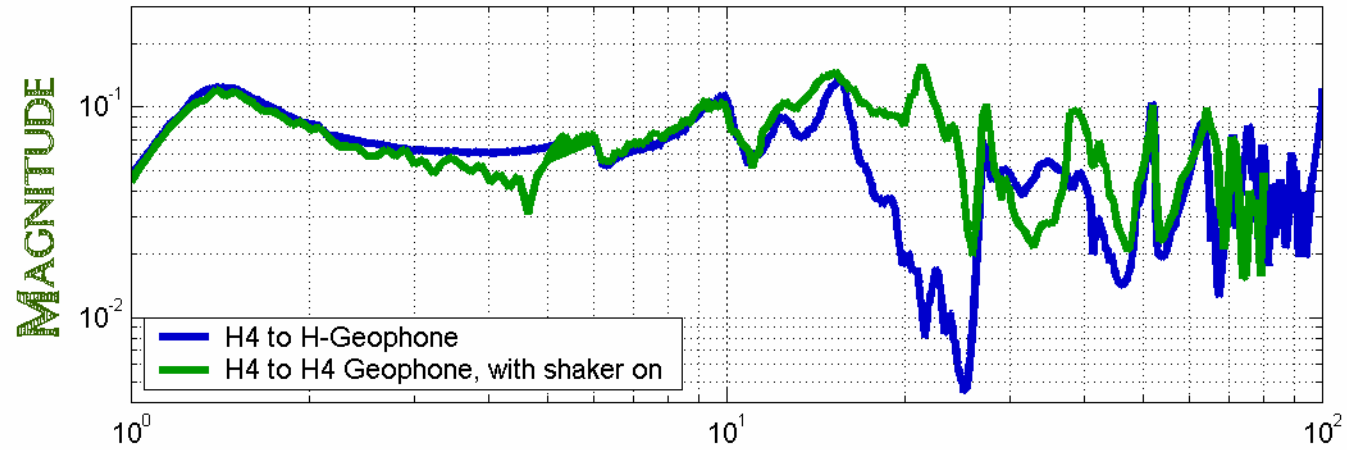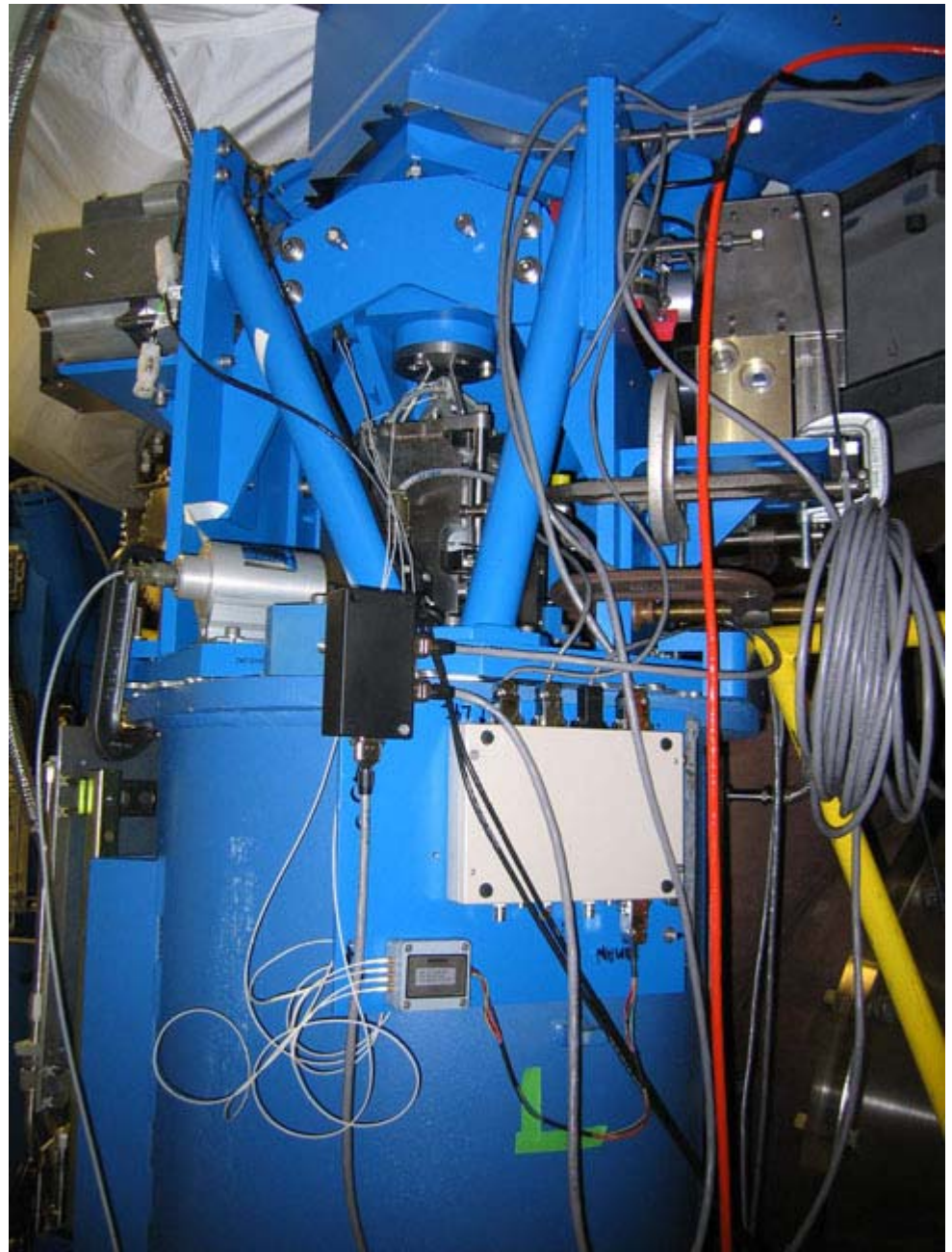# Hepi/Mepi

Collocated Horizontal Transfer Functions

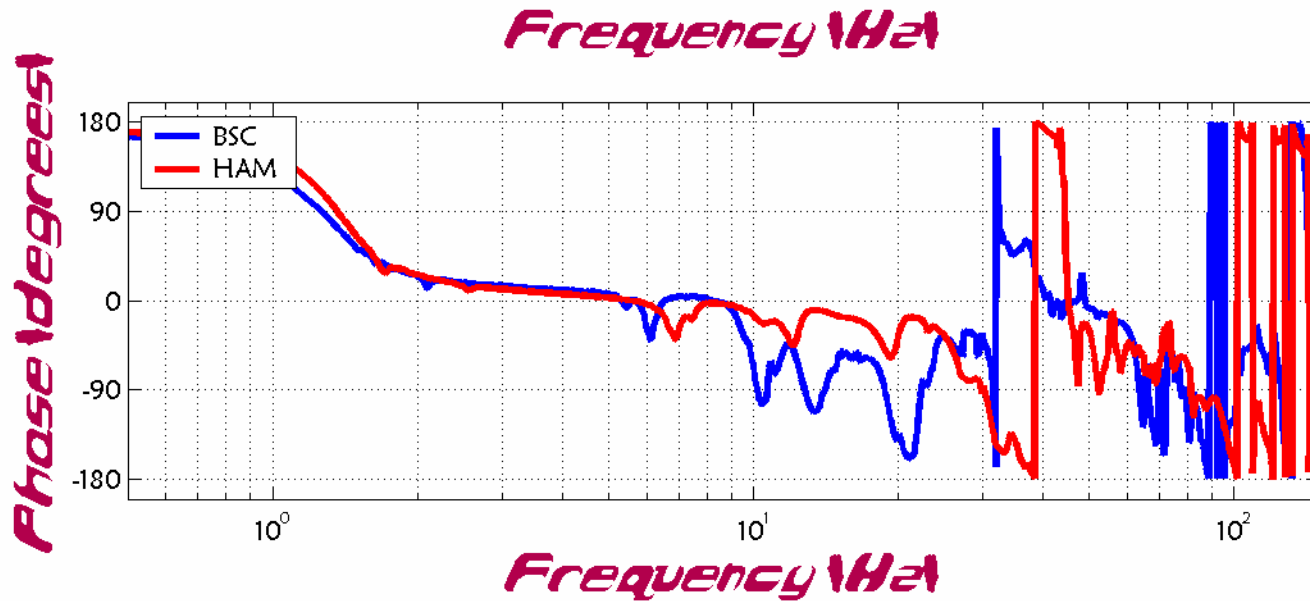Four Pier Average
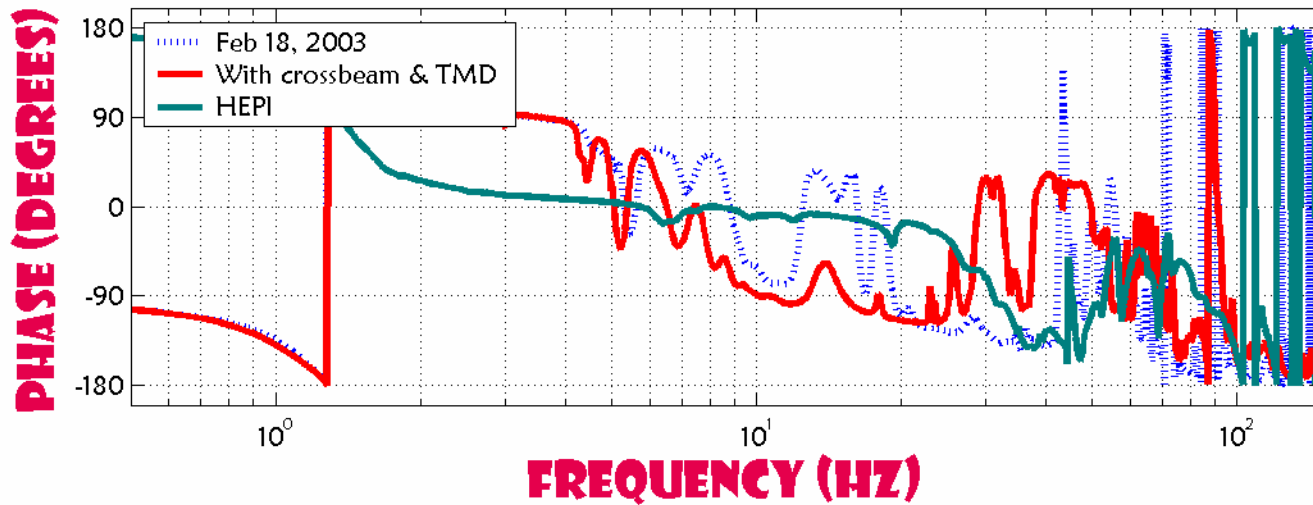
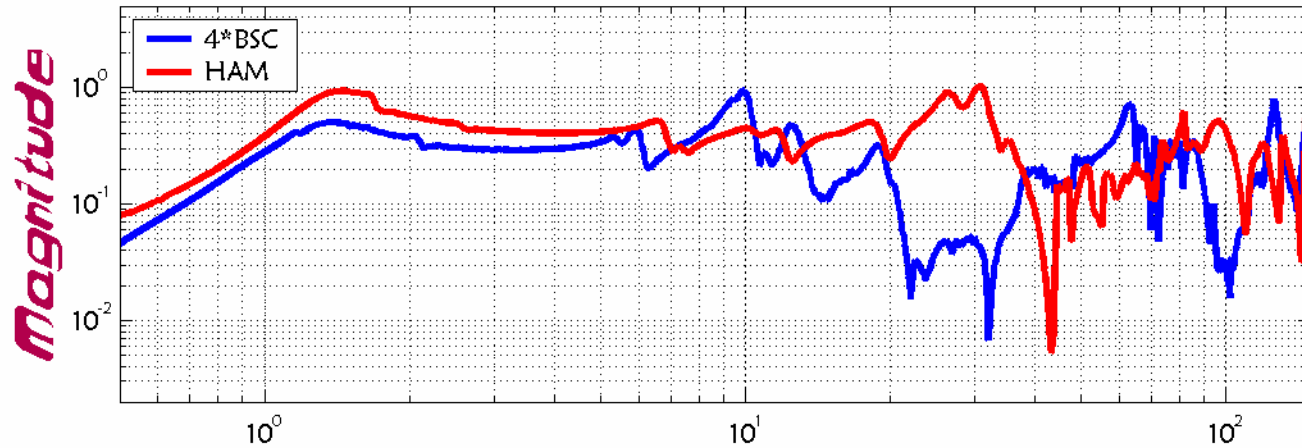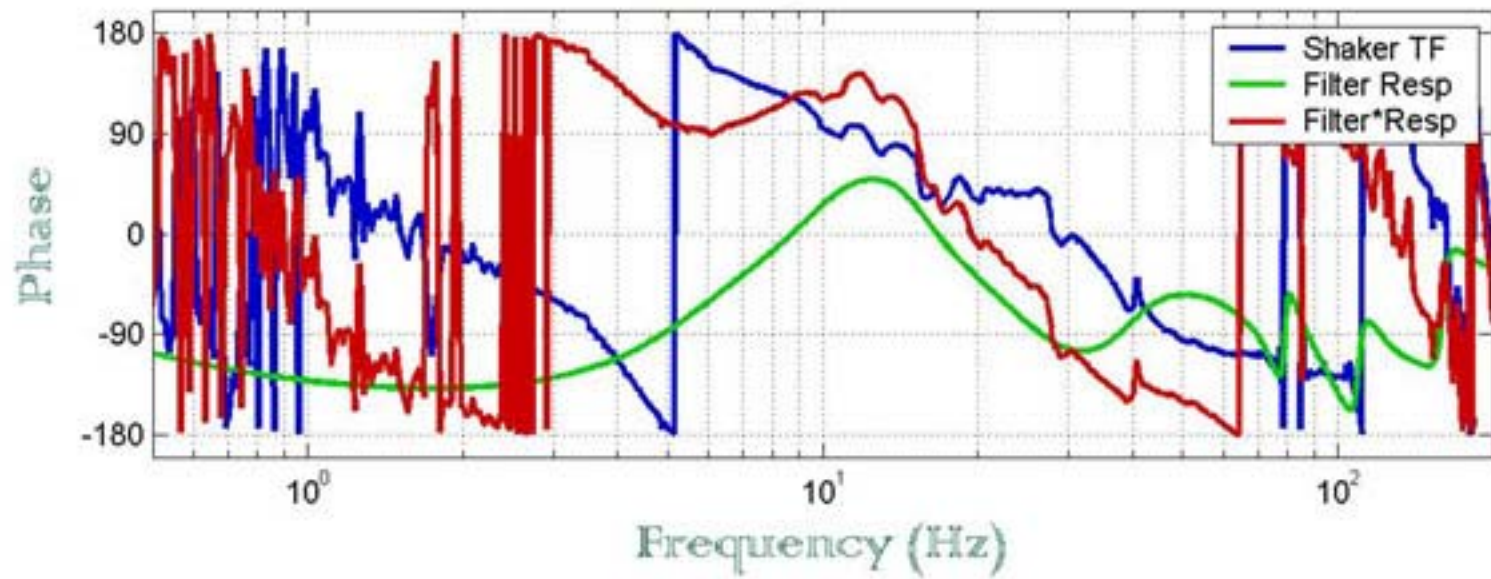# Dynamic Pier Stiffening

LIGO-G030653-00-Z
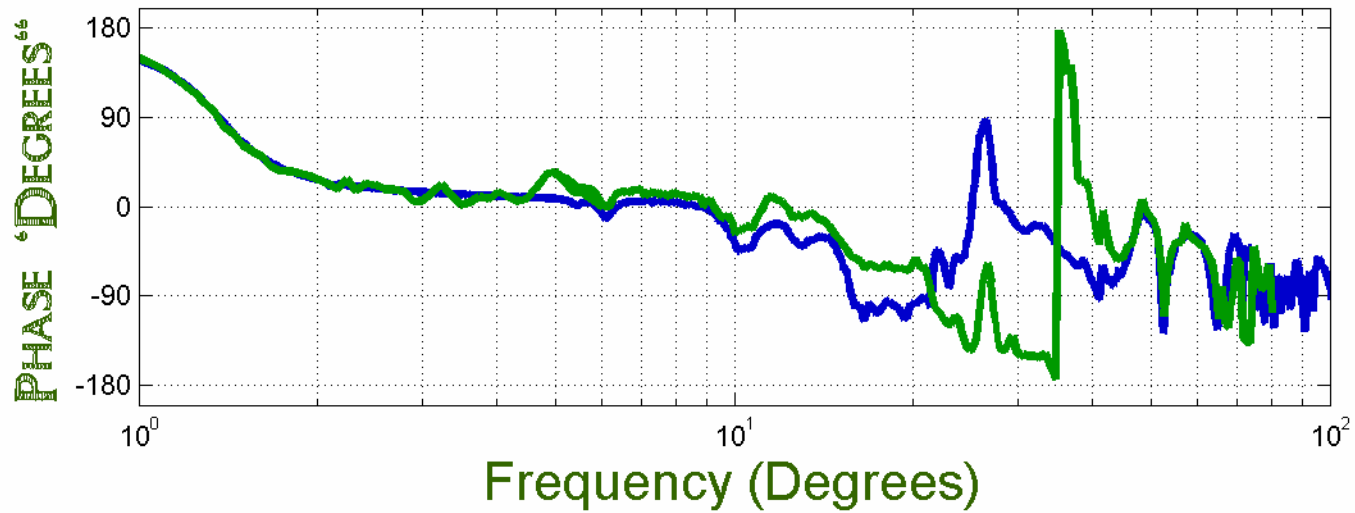
BSC Pier

We have tried to dynamically stiffen the BSC piers

X Mode Transfer Function

LIGO-G030653-00-Z

Shaker Filtering

Extra Gain = 0.4
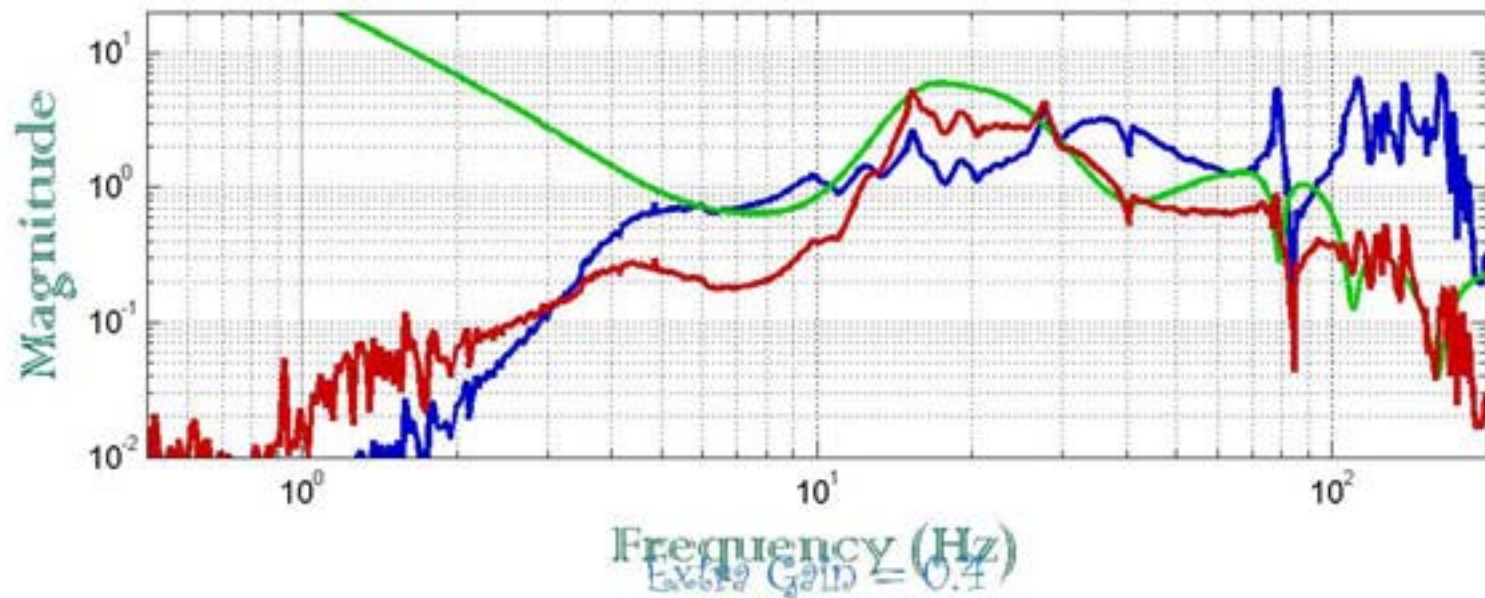
BSC X Filters

X Mode Loop Gain and Filters
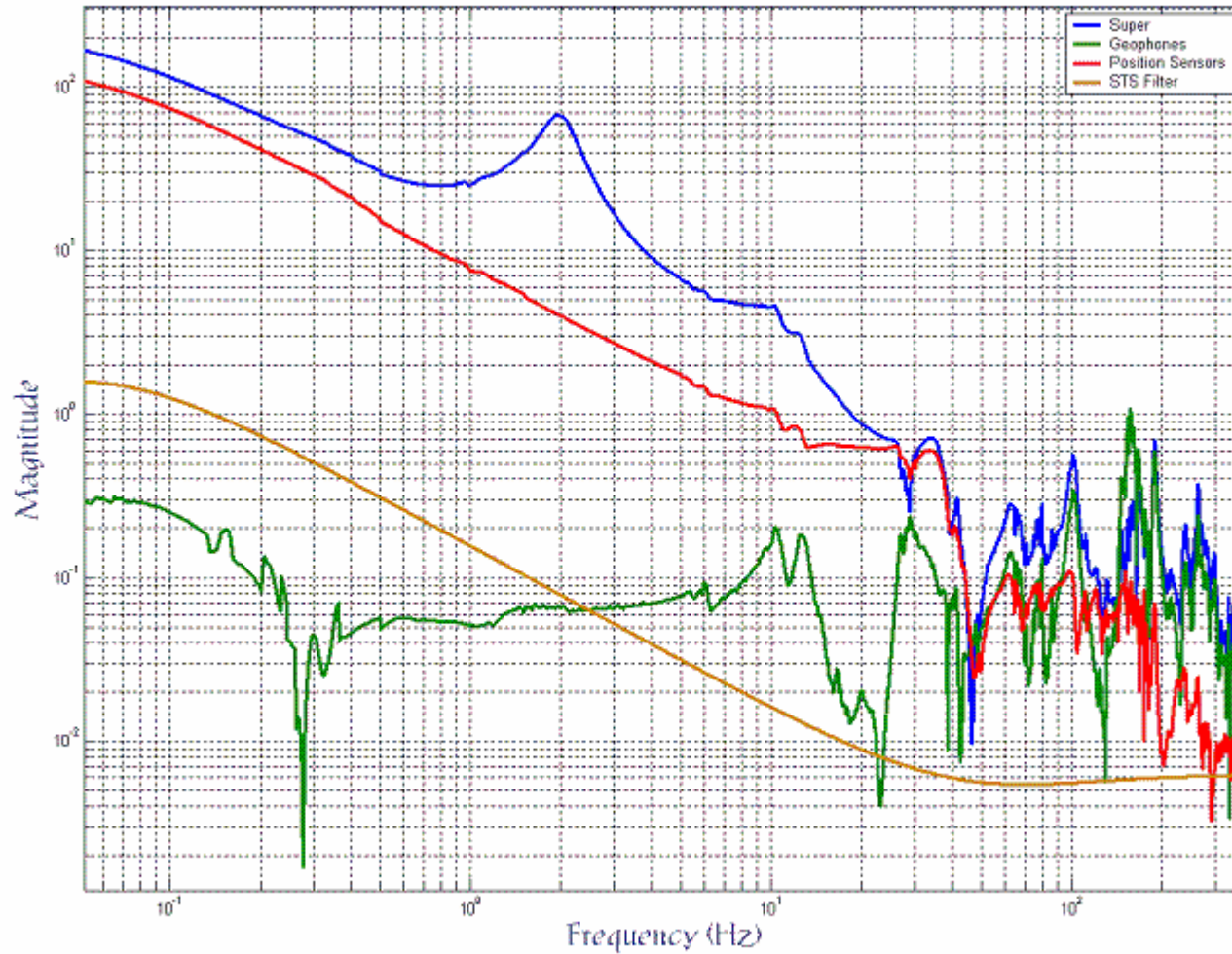
BSC Isolation (X)
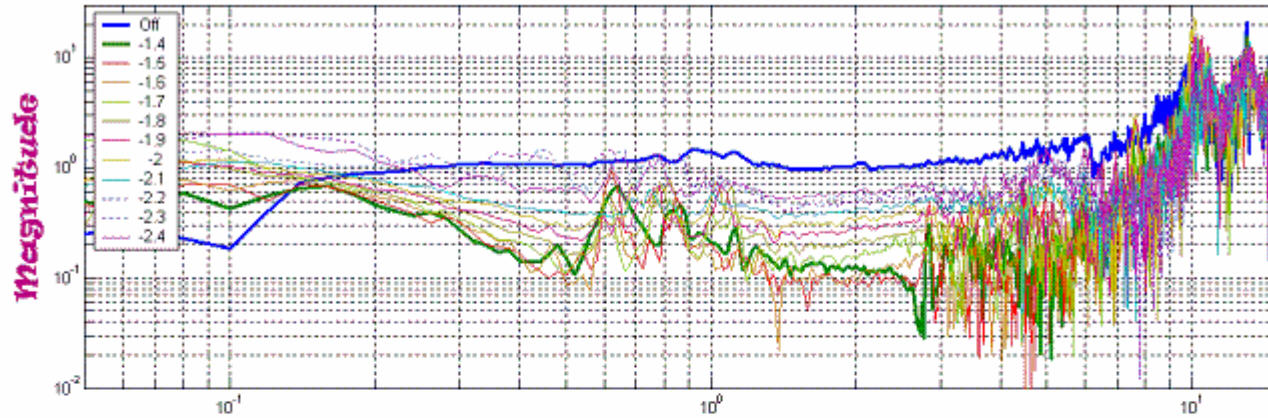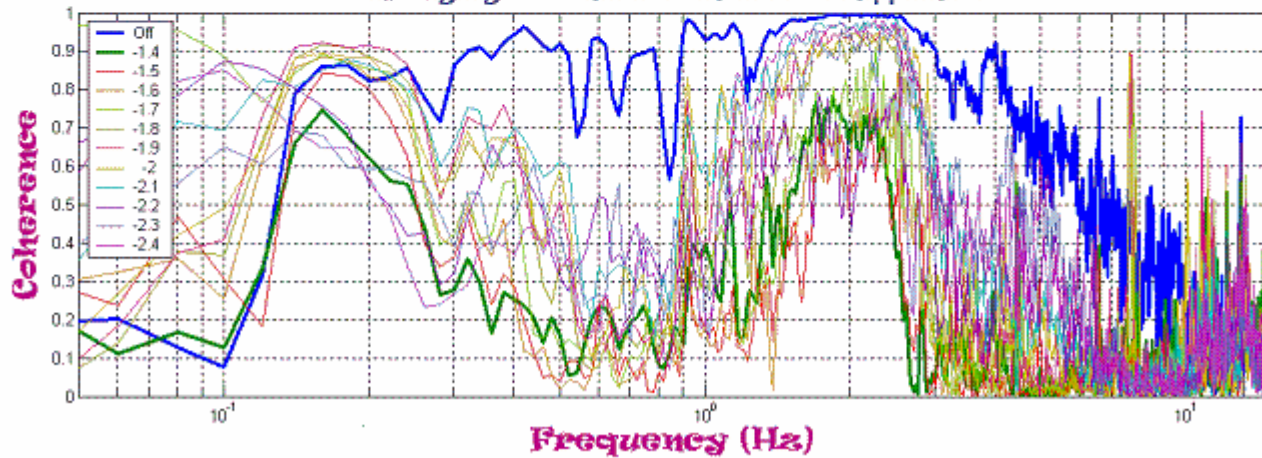
BSC Isolation Y
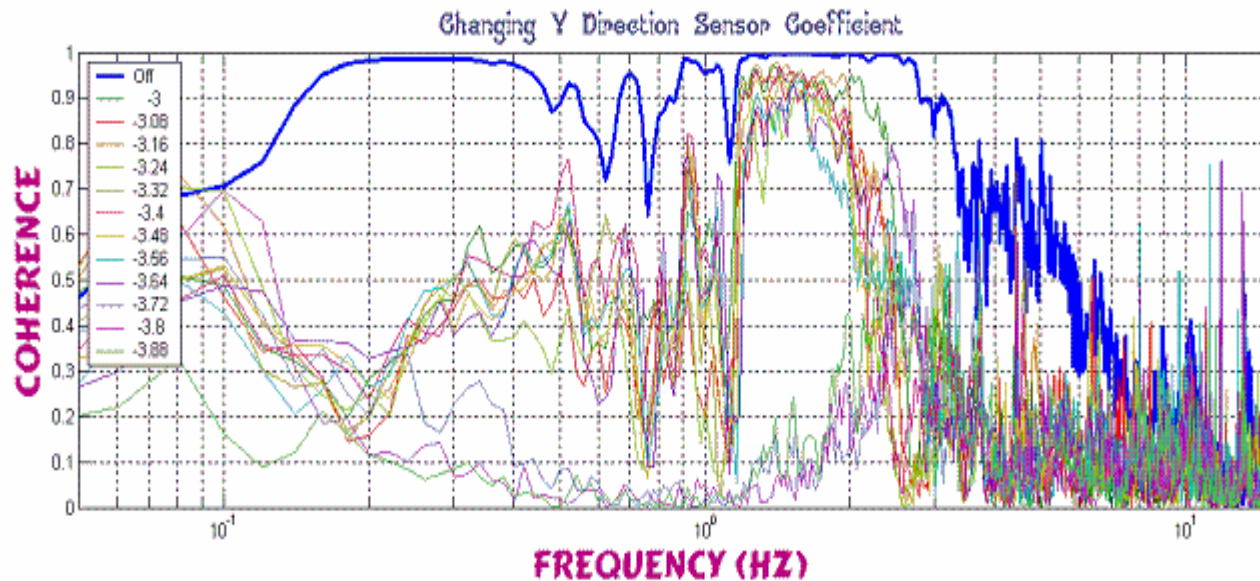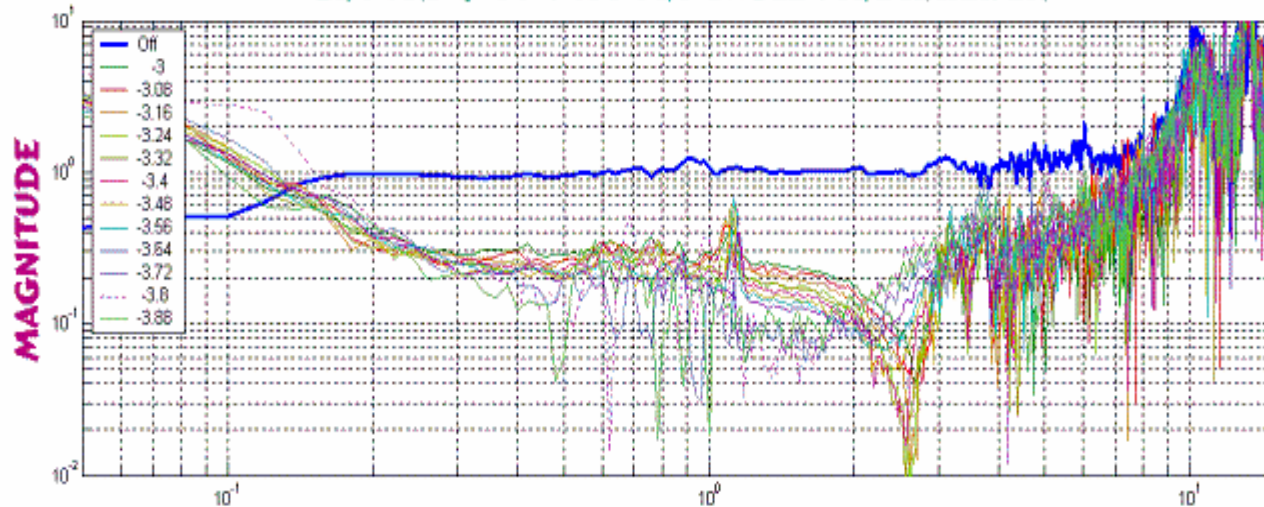
Sensor Correction Response (Y-Mode)

LIGO-G030653-00-Z