E2e modeling of AdvLIGO IMC etc

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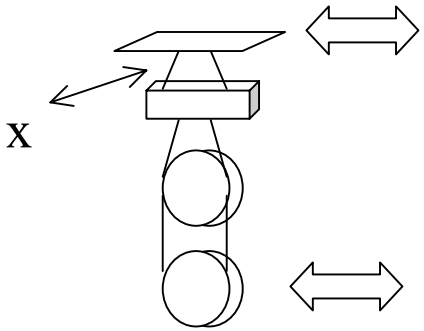
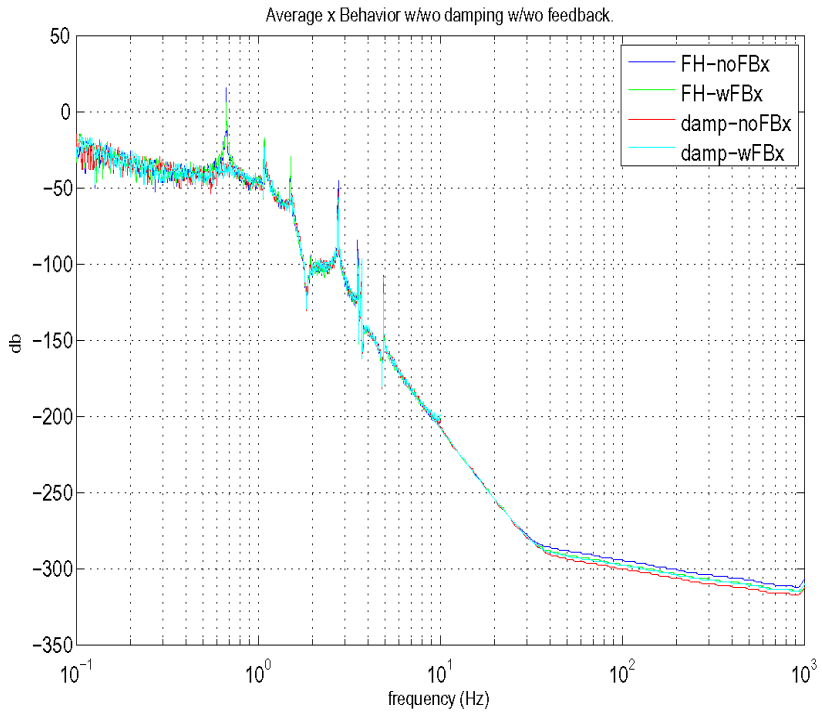
- HAM-SAS (V. Boschi et al)
- Single Stage HAM (B. Lantz et al)
- Triple Pendulum (M. Barton)
- Input Mode Cleaner (TP on Single Stage HAM)
- Quad Pendulum with violin (M. Barton)
- Detector plus GW source simulation (J. Jauregui)

HAM-SAS back reaction

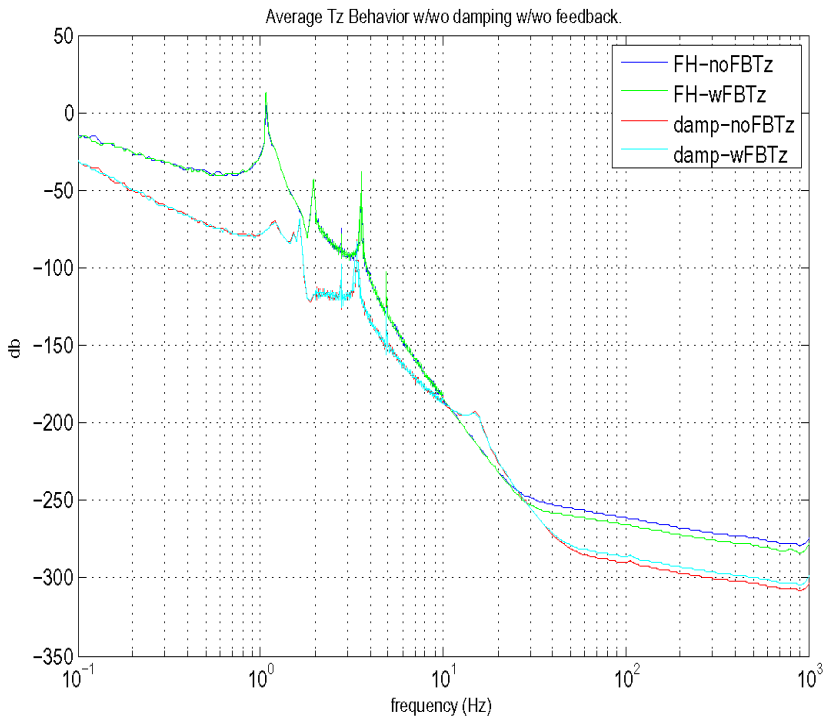


Suspension point

Actuation point (local damping)

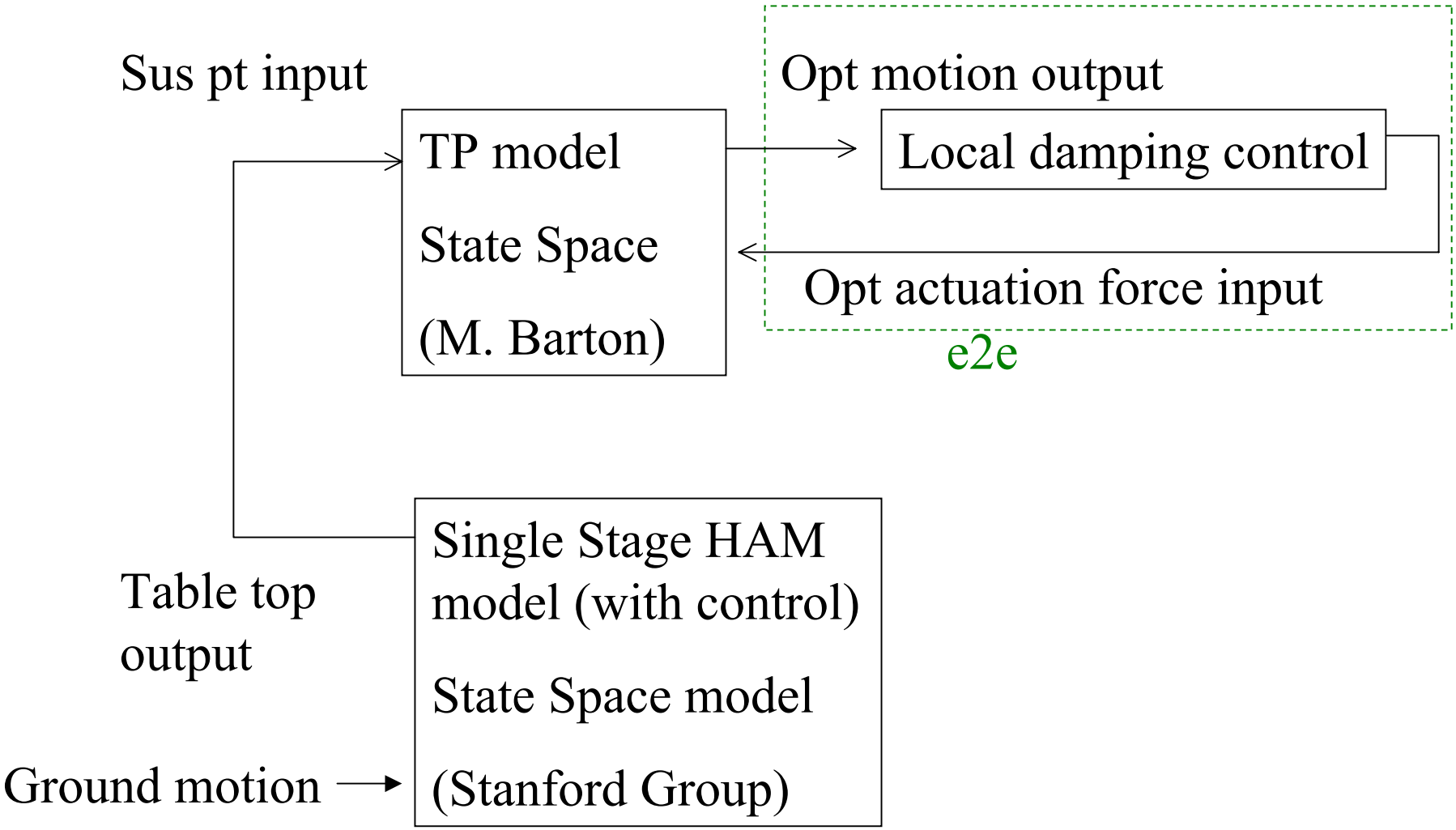


X



yaw

E2e model of Triple suspension on HAM



Single HAM

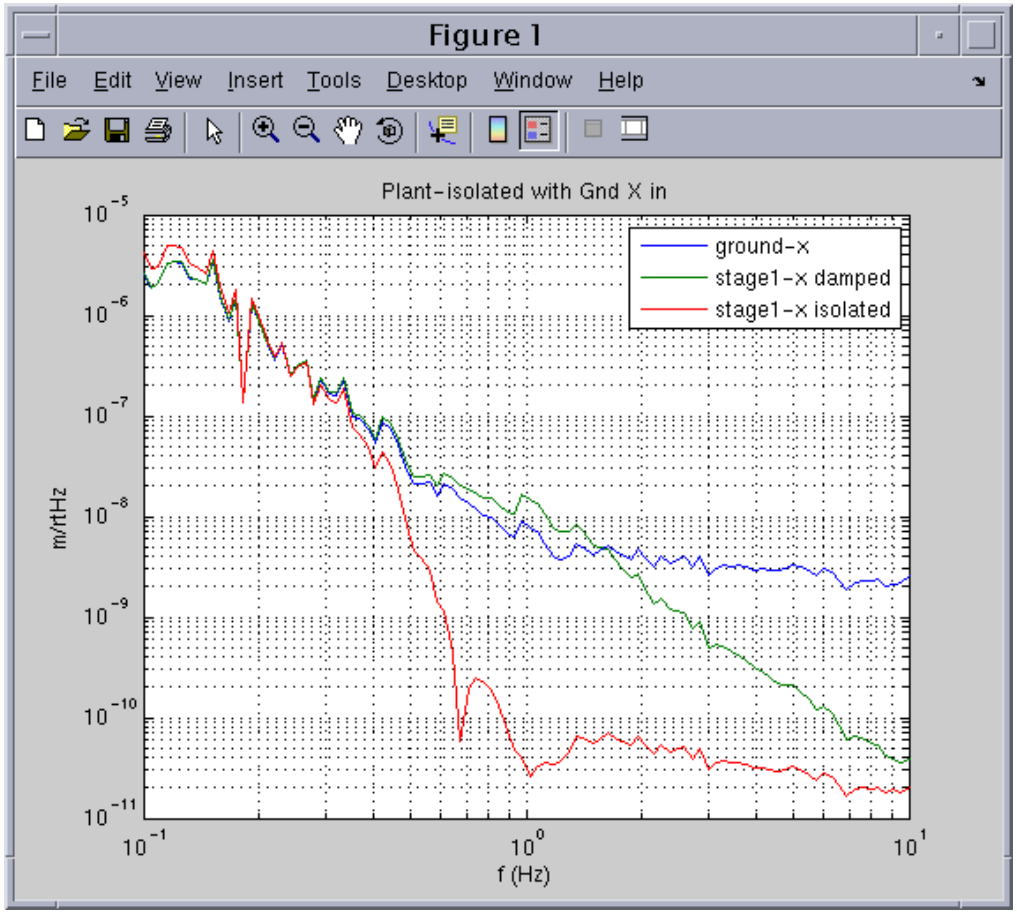
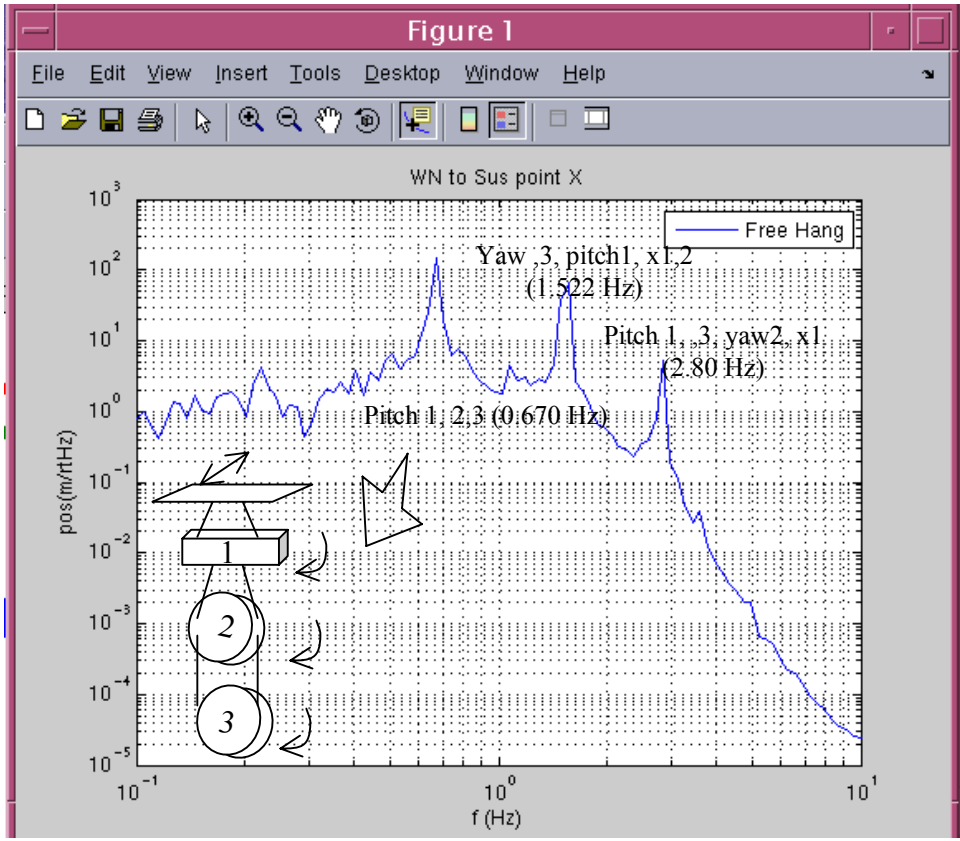
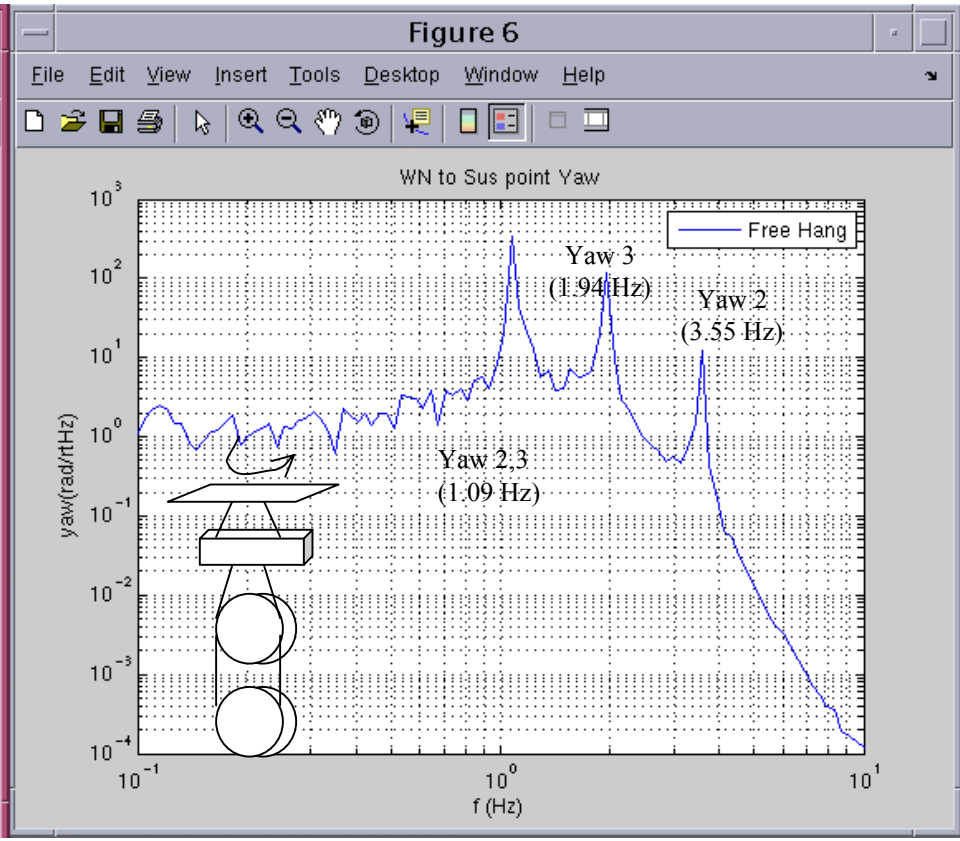


Figure 1
File Edit View Insert Tools Desktop Window Help
Plant-isolated with Gnd X in
ground-x
stage1-x damped
stage1-x isolated
m/rtHz
f (Hz)

Triple Pendulum pos yaw spectra (free hang)



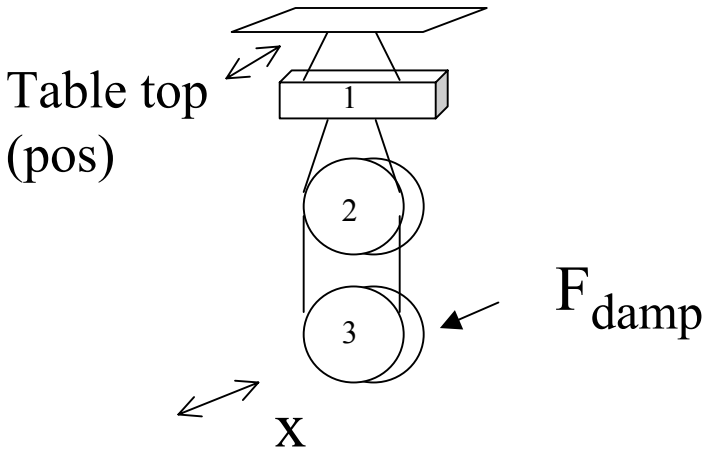


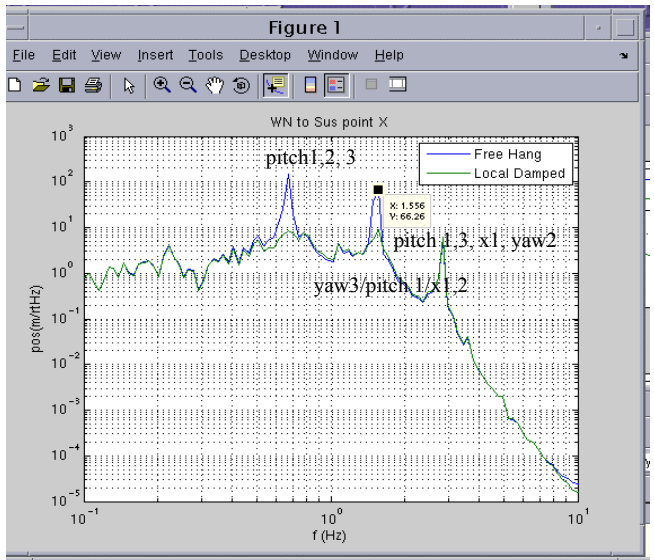
Sus pt pos - opt pos

Sus pt yaw - opt yaw

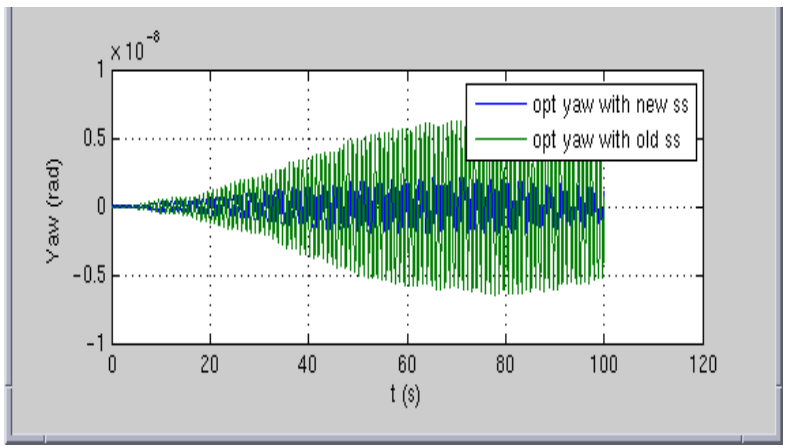
M. Barton, ASUS3L2ModeCalcMCProtoHWcorr.pdf

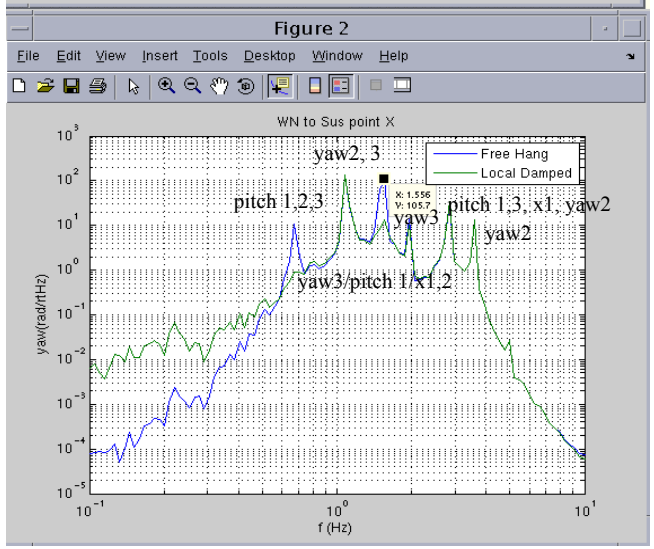
Optics response to sus-point disturbance





Opt pos sensor

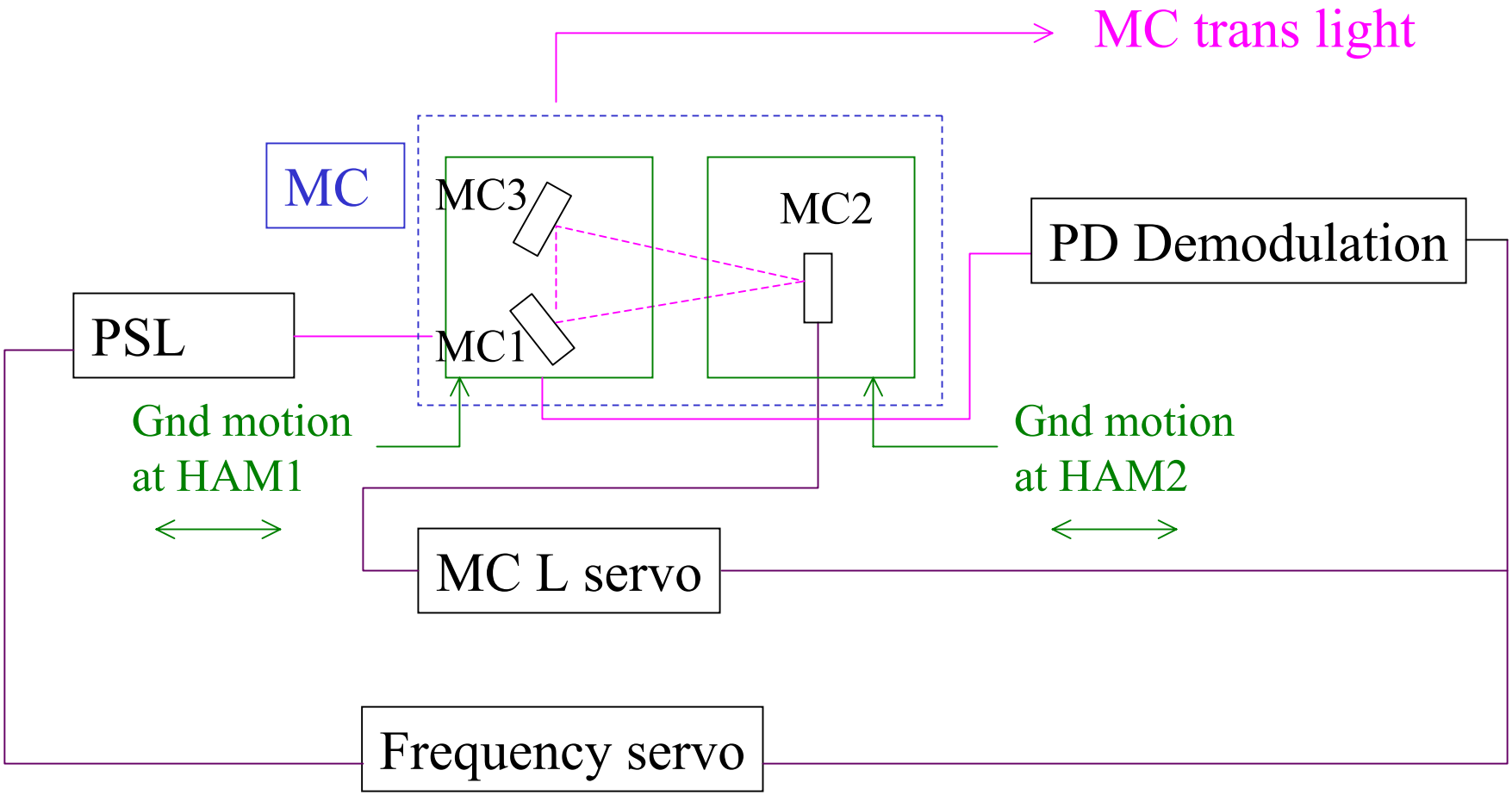




Opt yaw sensor

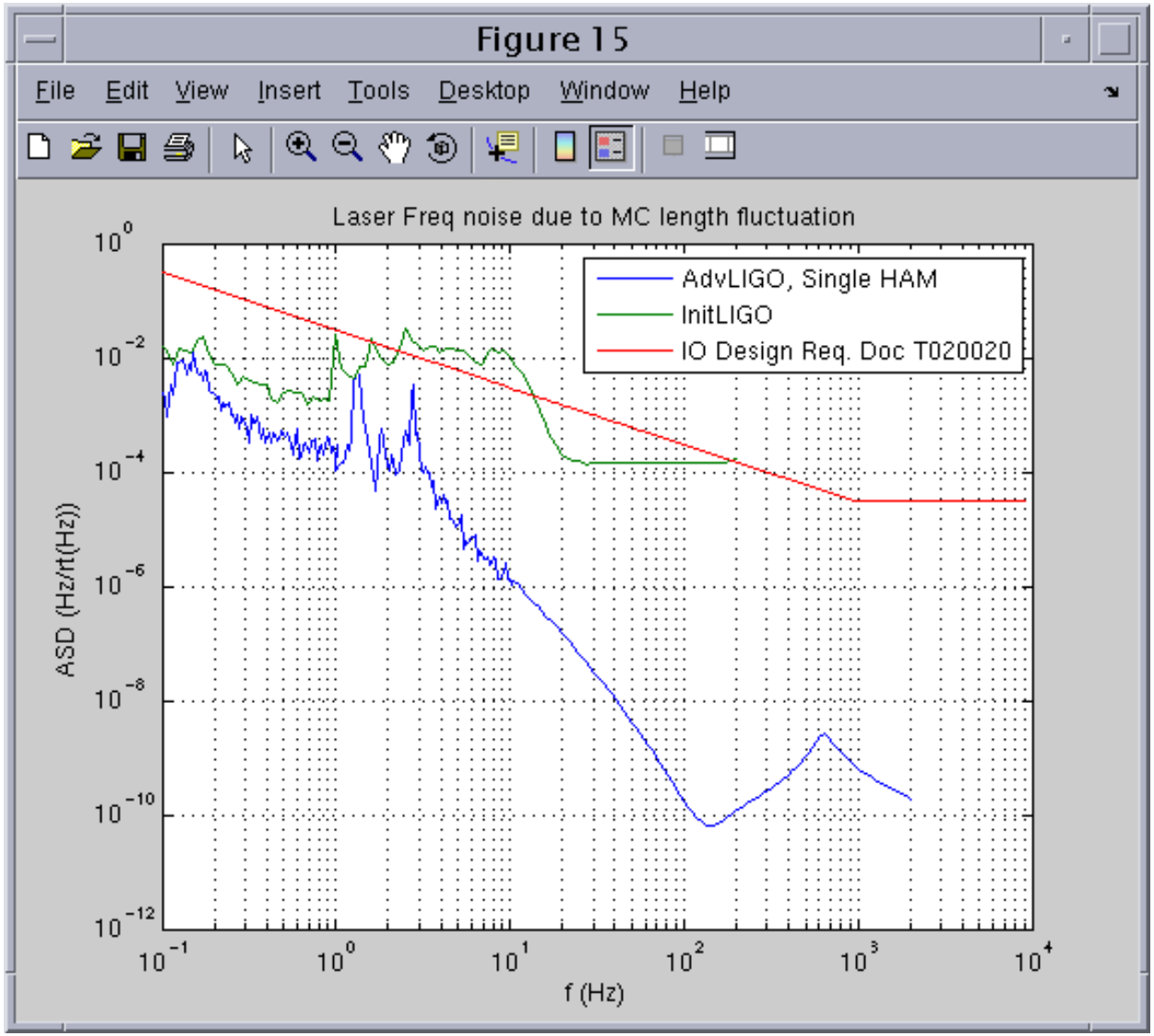
TP model on IP HAM with realistic ground motion

E2e model of Adv MC

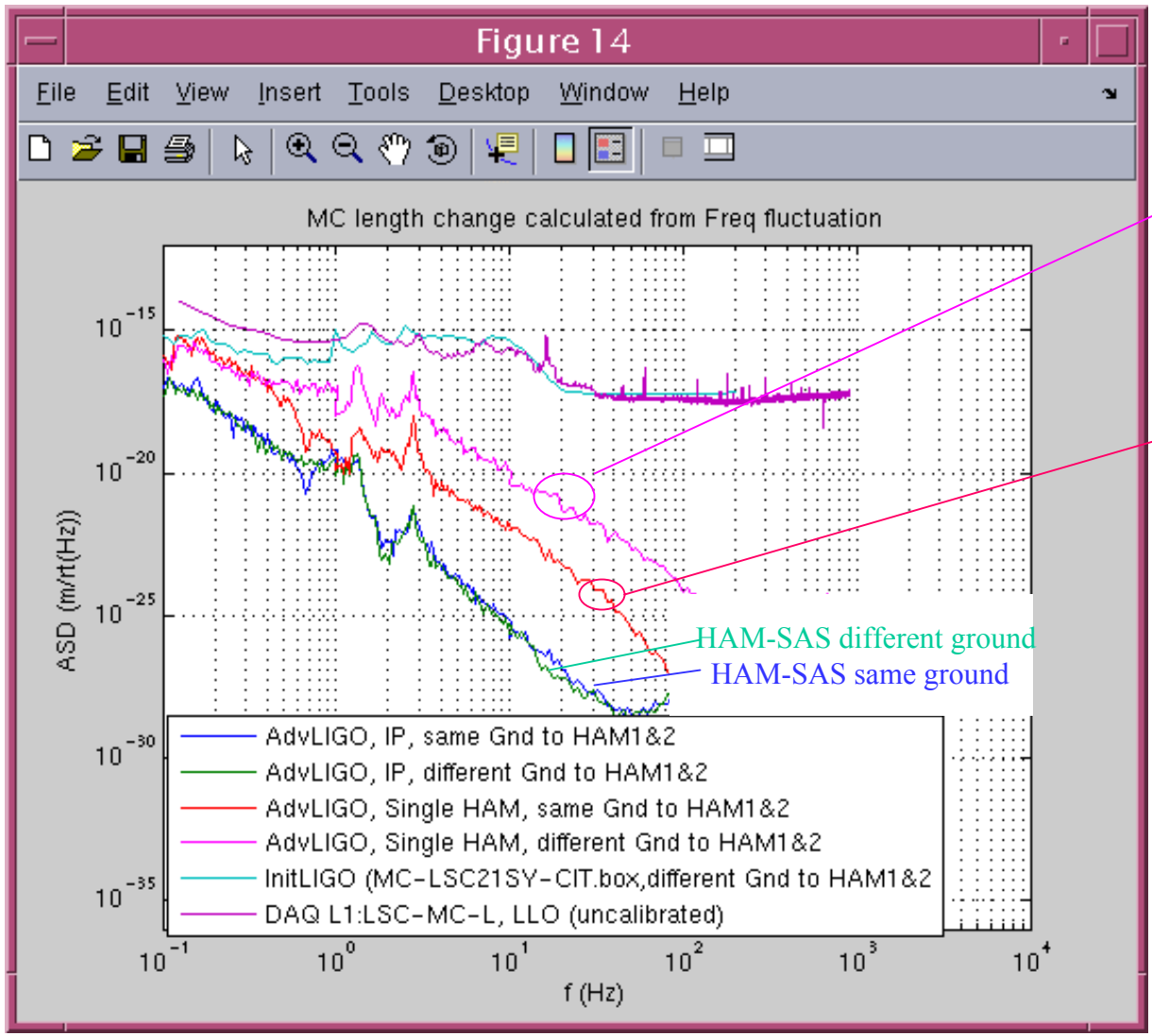


MC Length fluctuation → Frequency noise of MC trans light

MC Trans frequency



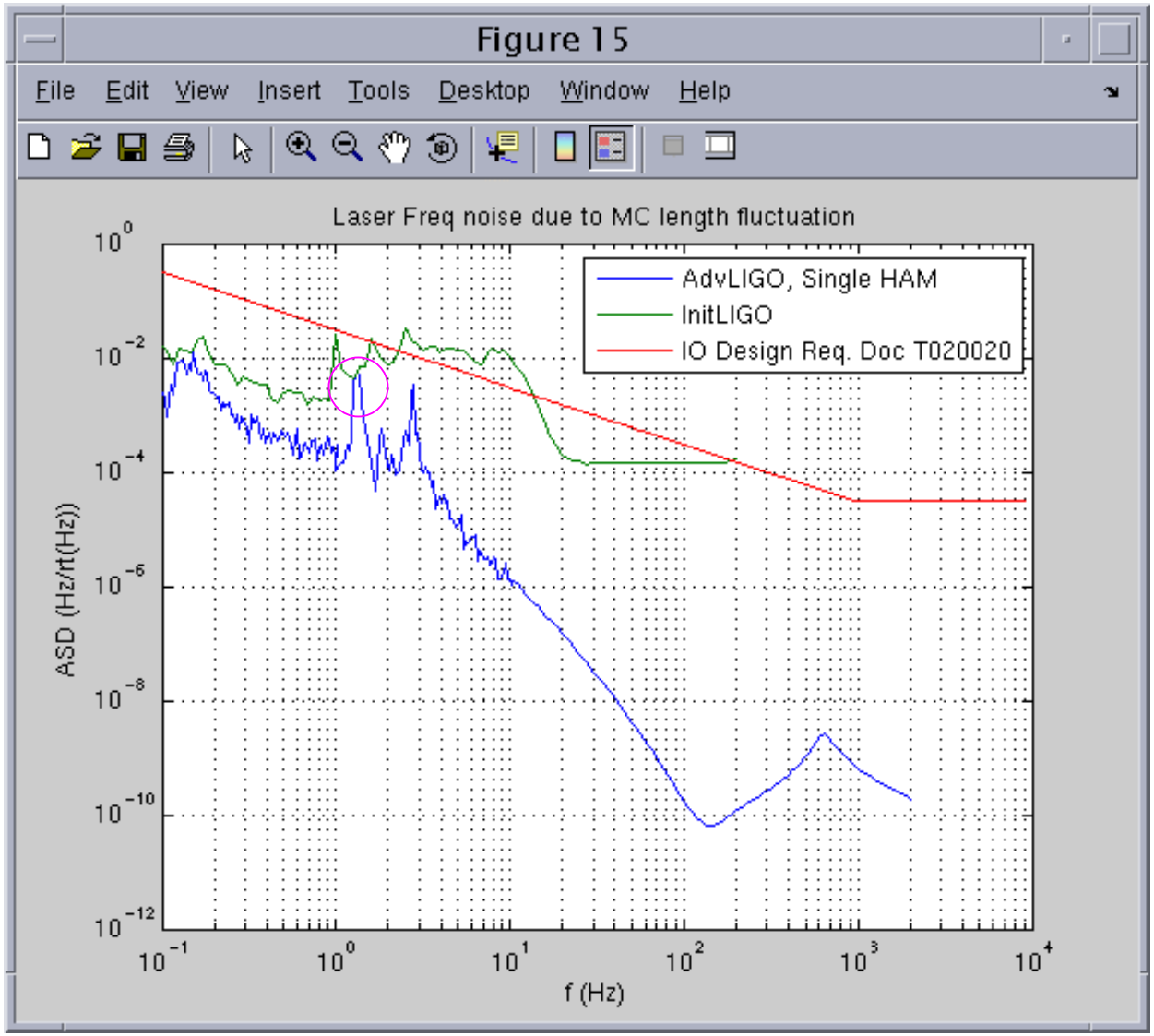
MC Trans frequency (finding 1)



HAM1 & HAM2 experience different ground motion

HAM1 & HAM2 experience same ground motion

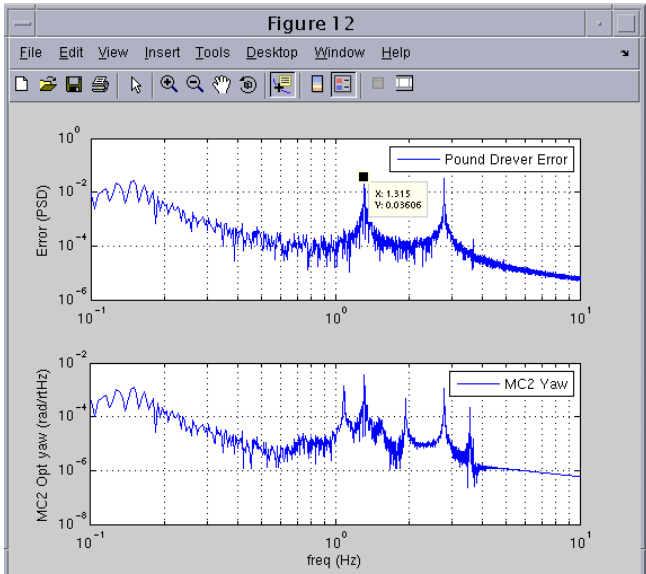
MC Trans frequency (finding 2): 1.3 Hz peak (cont'd)

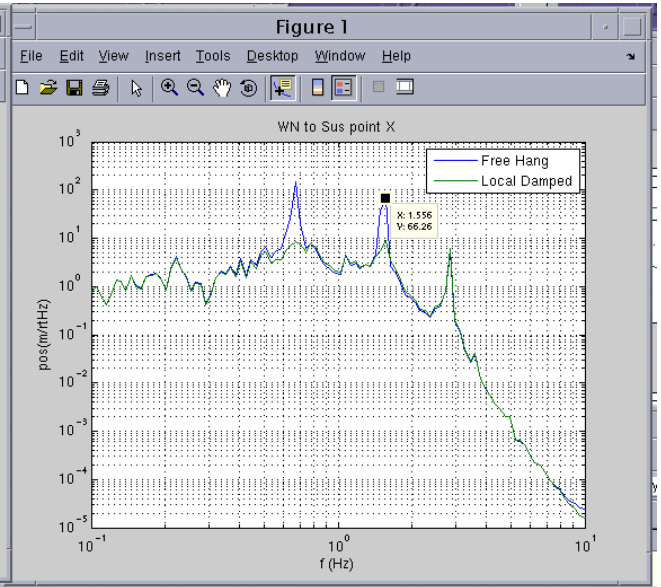


MC Trans frequency (finding 2): 1.3 Hz peak (cont'd)

Demod error

MC2 yaw

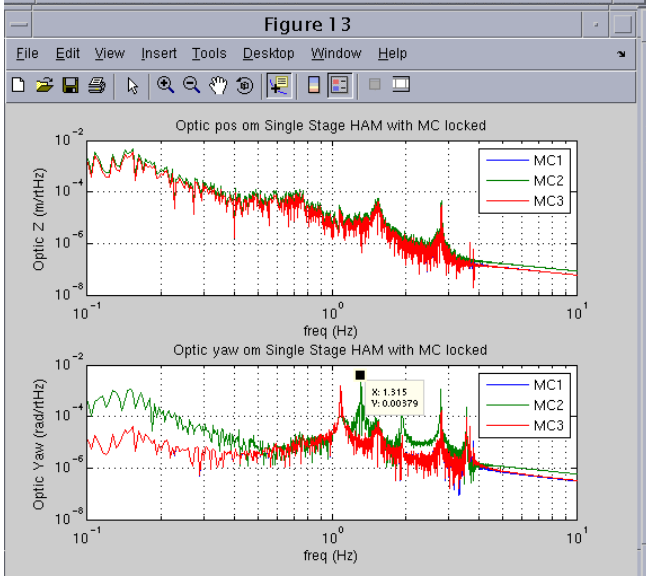


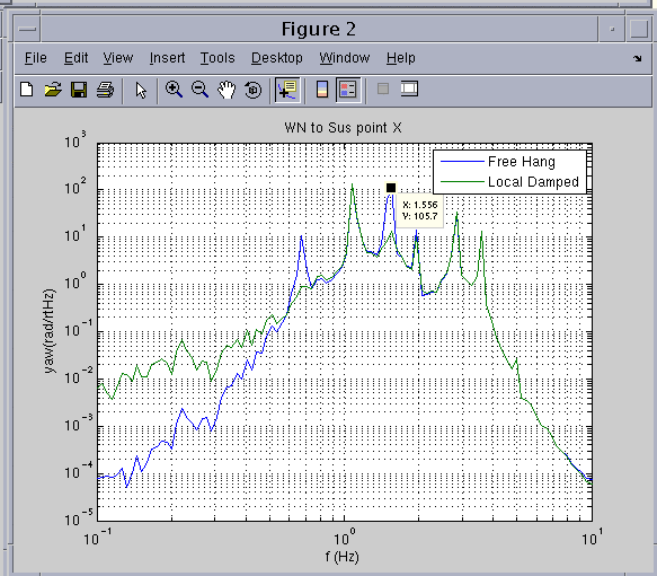


Excite suspt Pos
Local damp opt pos
Opt pos sensor

MC pos

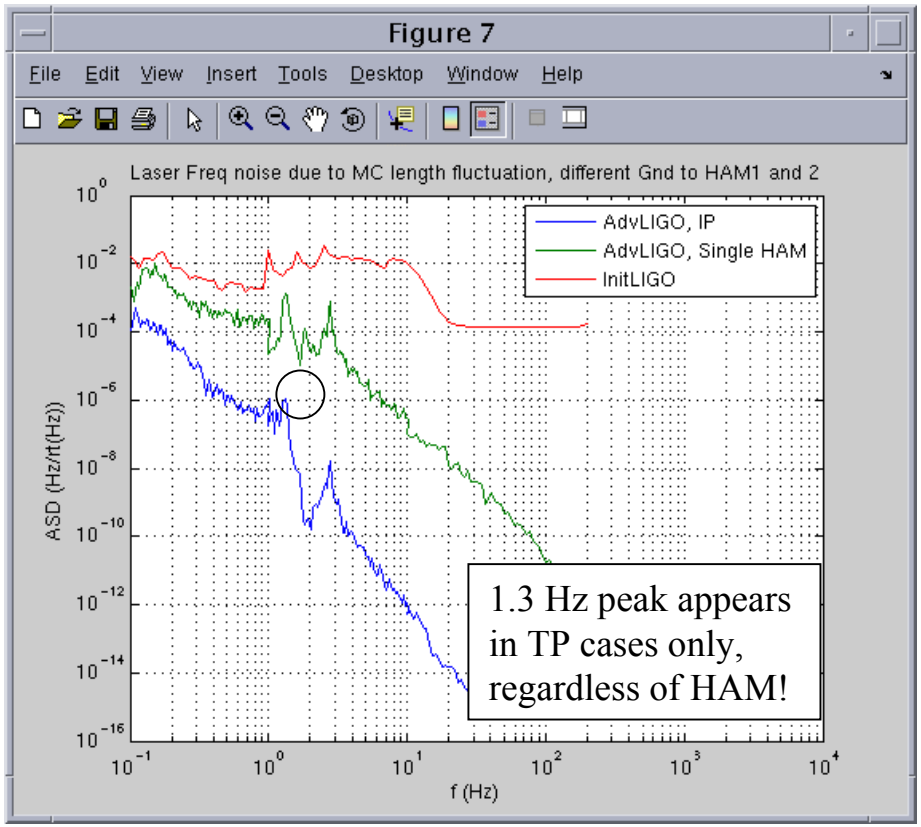
MC yaw



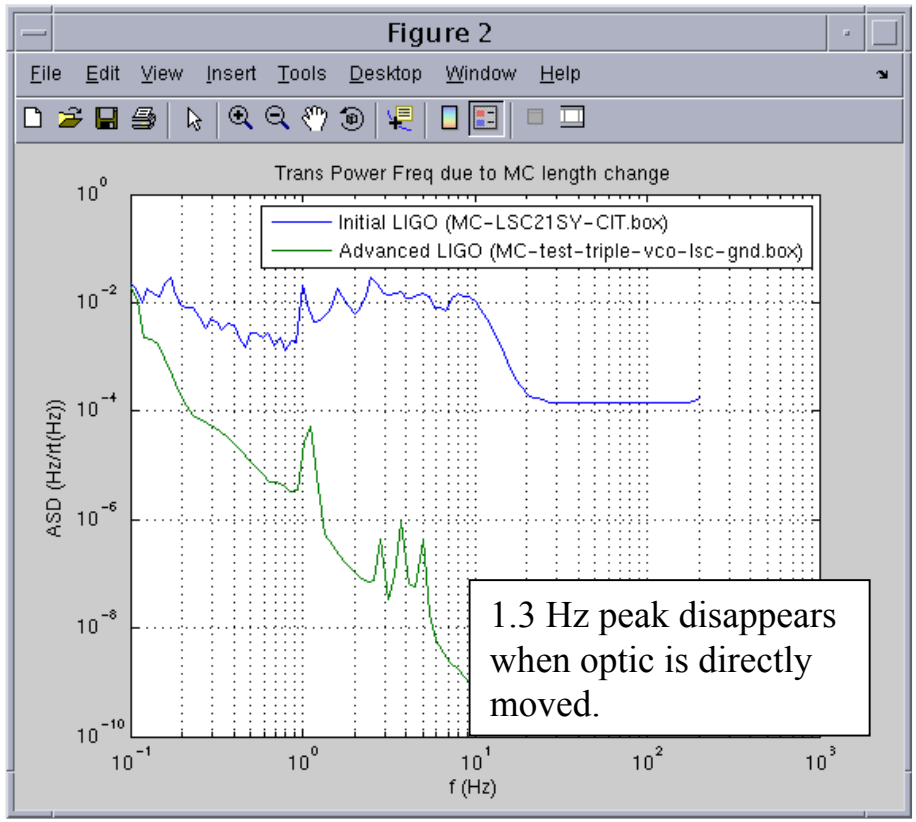


Excite suspt Pos
Local damp opt pos
Opt yaw sensor

MC Trans frequency (finding 2): 1.3 Hz peak (cont'd)

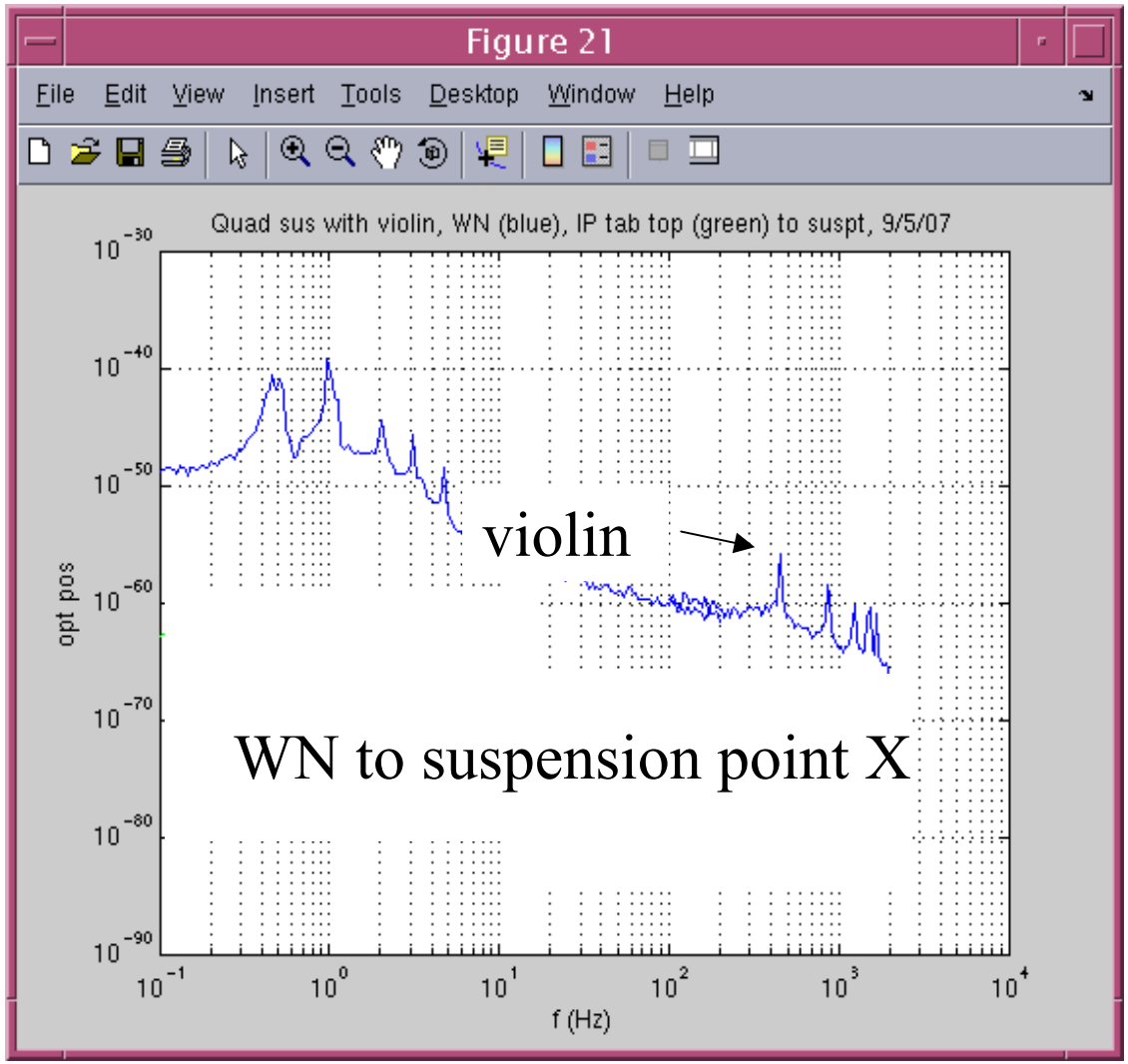


Freq control to laser model

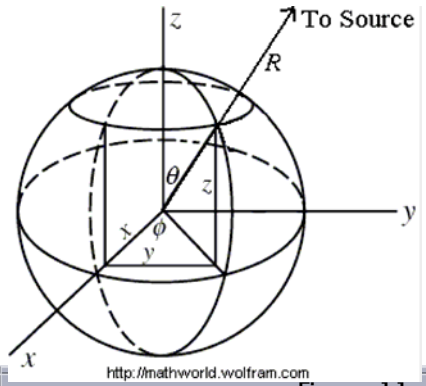


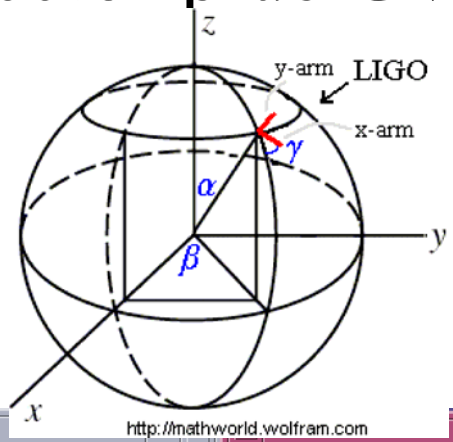
Pseudo-freq control
(move mc2 mirror directly)

Quad sus with violon

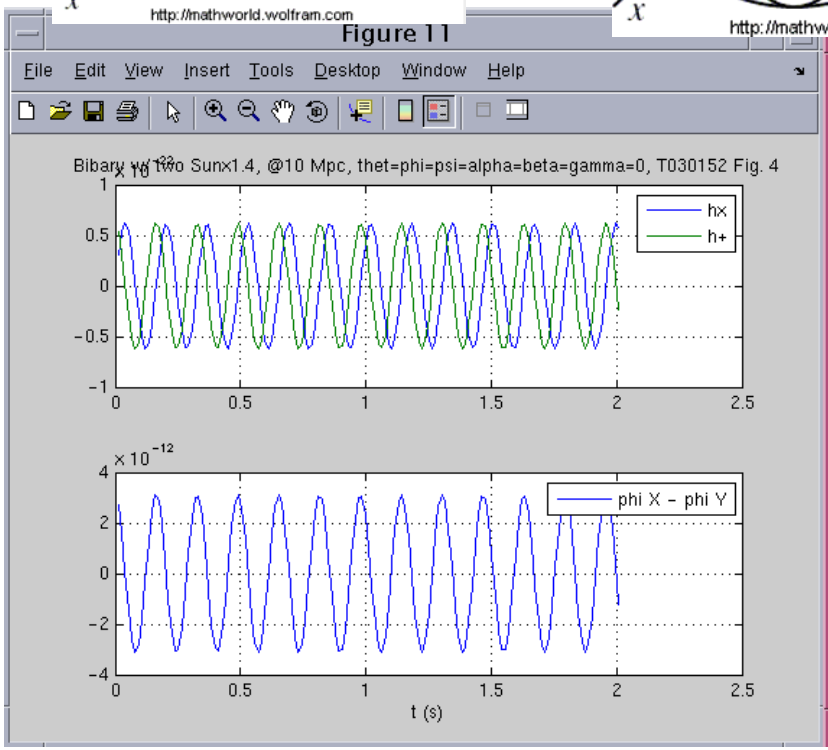


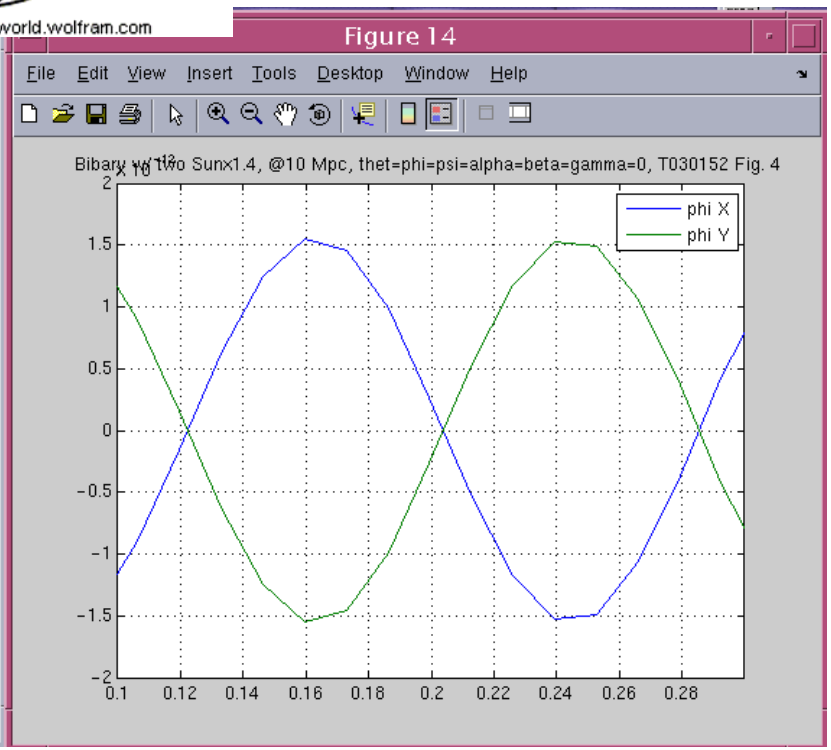
Detector plus GW source





Jeff Jauregui, 2003 SURF
(mentor: H. Yamamoto)





h_+=7.2e-23, h_x=0, θ=ϕ= ψ=0, α=β=γ=0

Status of e2e AdvLIGO models

	Available	Under development
HAM	-Single stage -HAM-SAS	- Ground sensor correction (0.1 – 1 Hz)
Triple sus (MC) Mass= 2.9 Kg	-E2e model w/o violin modes (M. Barton)	-E2e model w/ violin
Mode Cleaner	-Seismic disturbance in X	- Seismic Y/Yaw disturbance (w/wavefront sensor) -Simple radiation pressure model -Frequency fluctuation studies

Status of e2e AdvLIGO models (cont'd)

	Available	Under development
Quad sus	-E2e model w/violin	-Local damping control -Simple length sensing control
GW source	-Code validated for simple cases	-Integrated into arm model with quad sus violin

Acknowledgment

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