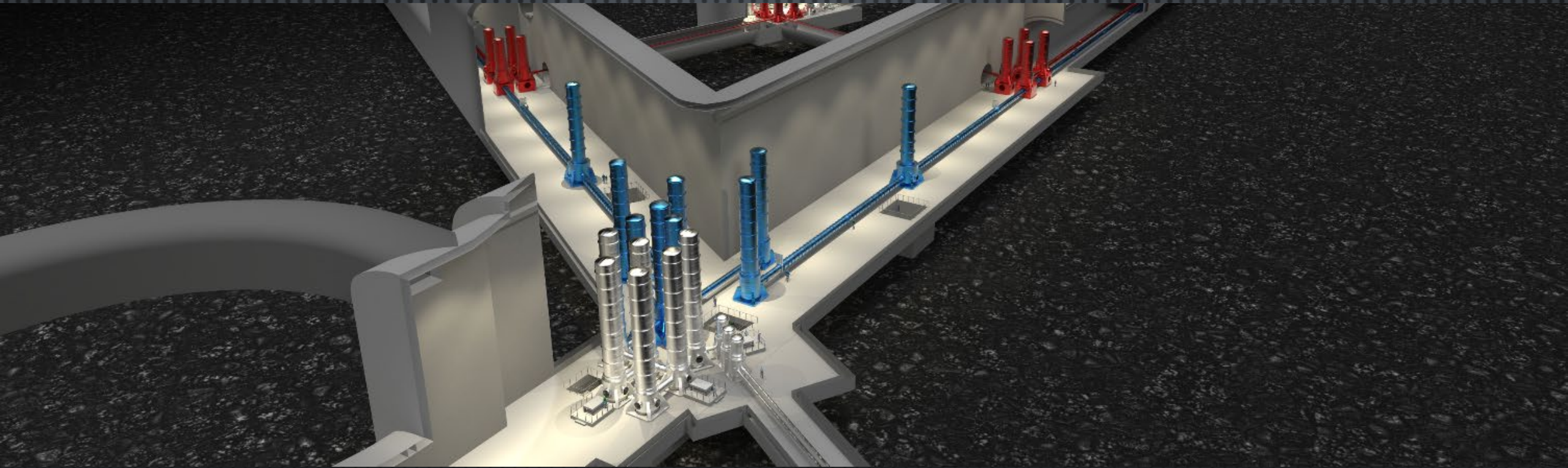




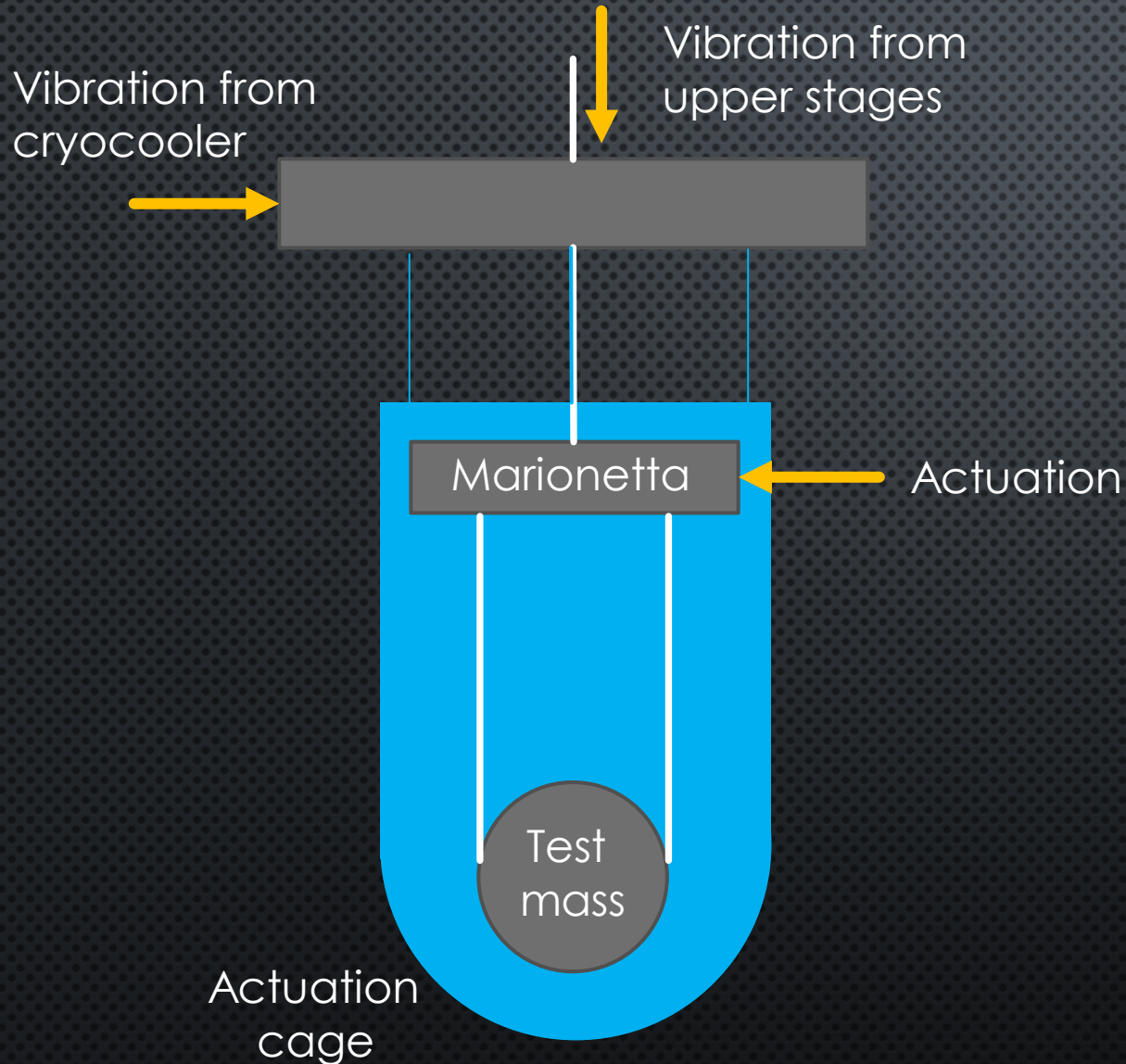
ET ANGULAR CONTROLS SESSION SUMMARY



Download other slides from Tuesday afternoon session

MODEL OF PAYLOAD / FINAL SUSPENSION STAGES

(WORK IN PROGRESS)

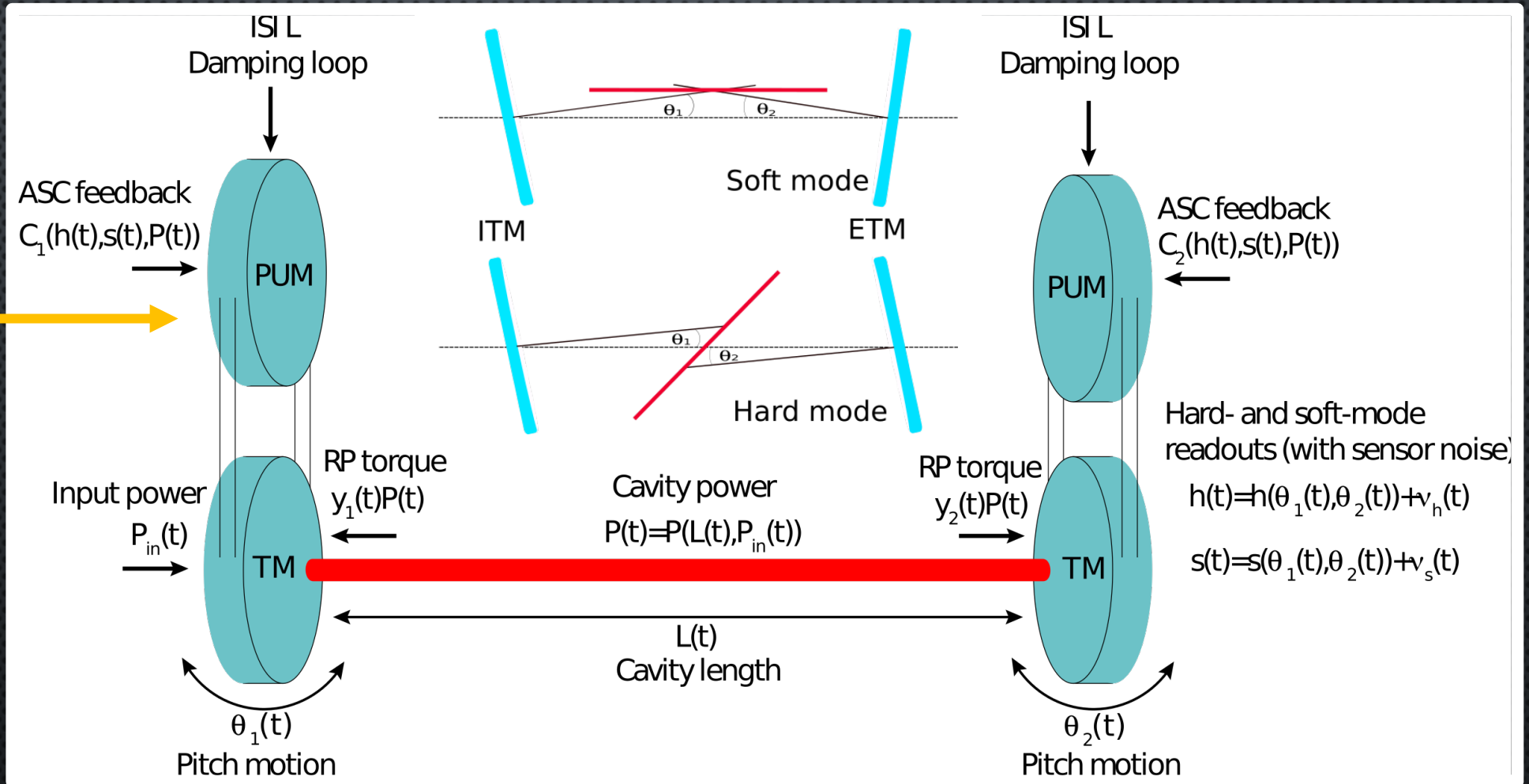


Need to explore whether actuation on test mass (during interferometer lock) might be useful for angular controls.

Need to understand whether angular controls set constraints on angular resonance frequencies in the Marionetta/test-mass system.

MODEL SKETCH

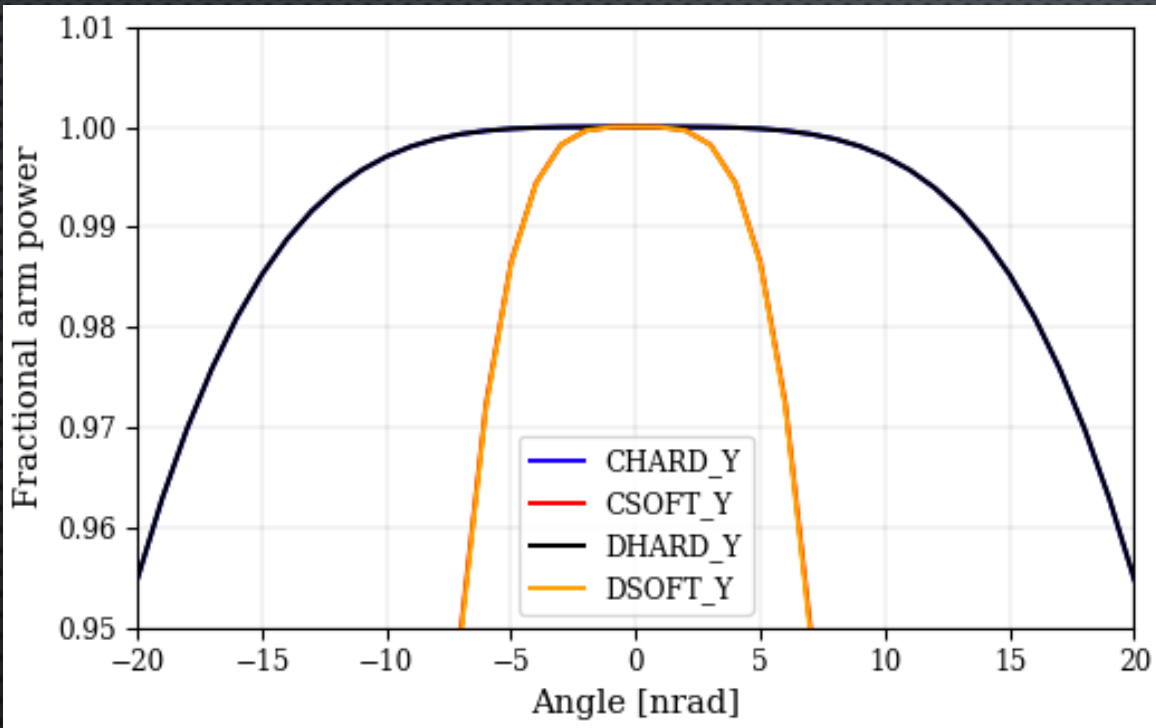
ET-LF:
Marionetta
instead of PUM



ALIGNMENT RMS REQUIREMENT

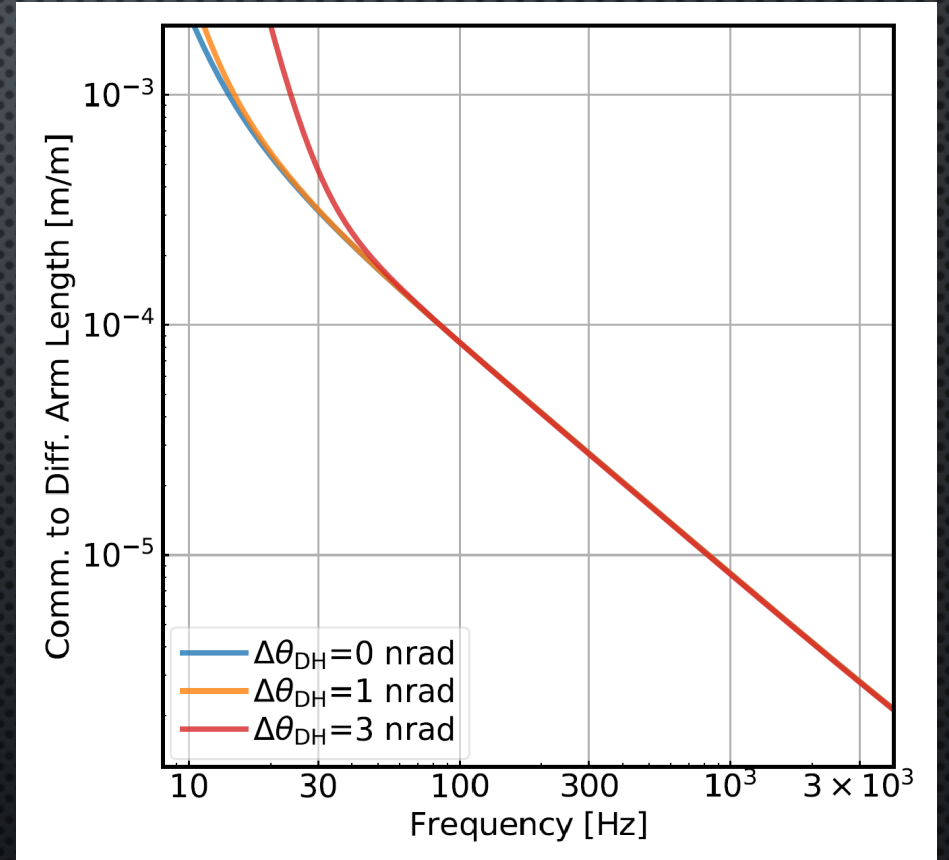
(WORK IN PROGRESS)

Power built-up in ET-LF as a function of misalignment



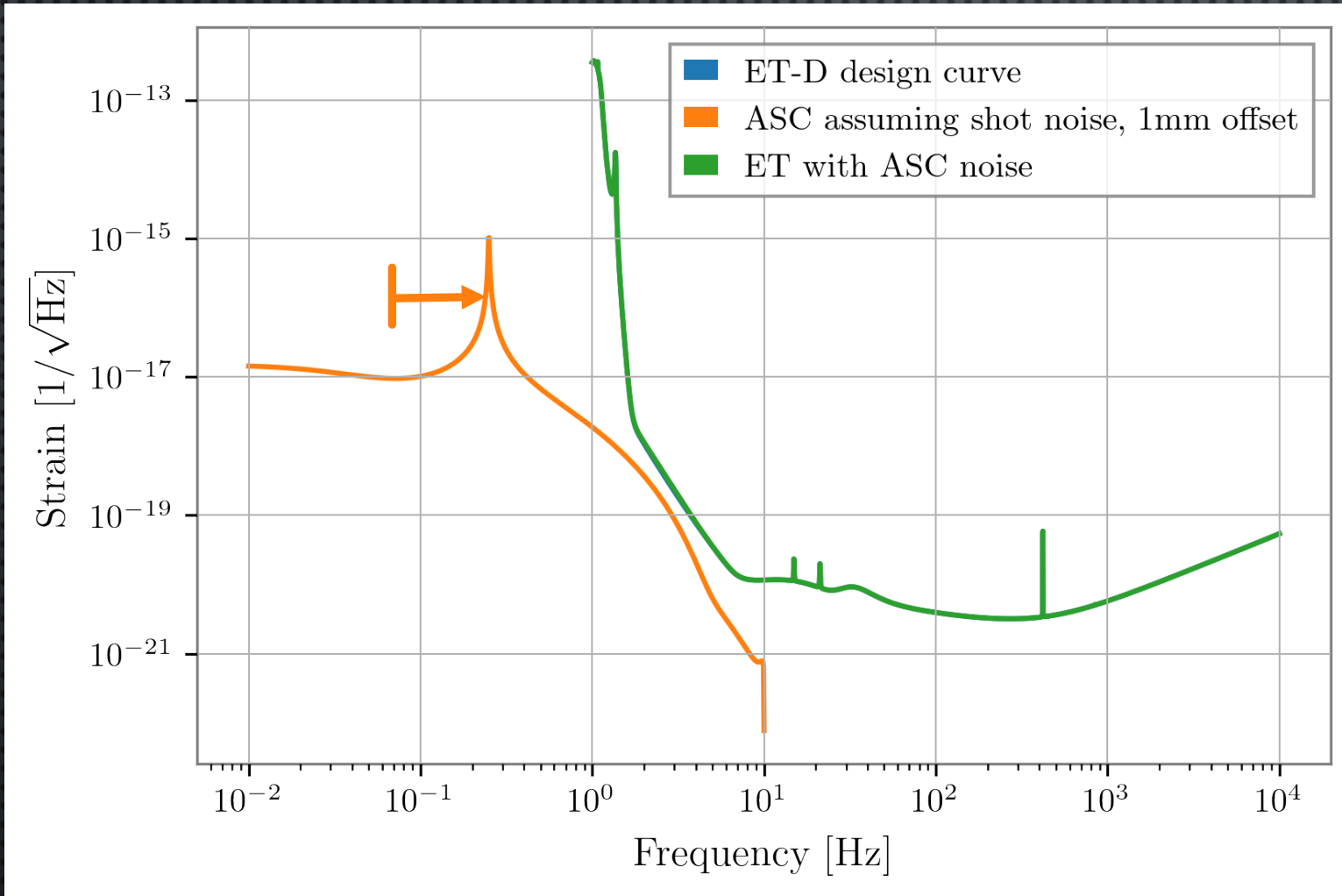
D Brown

CARM/DARM coupling
(here for LIGO)



H Yu

SPICYPY: FIRST SIMPLE MODEL

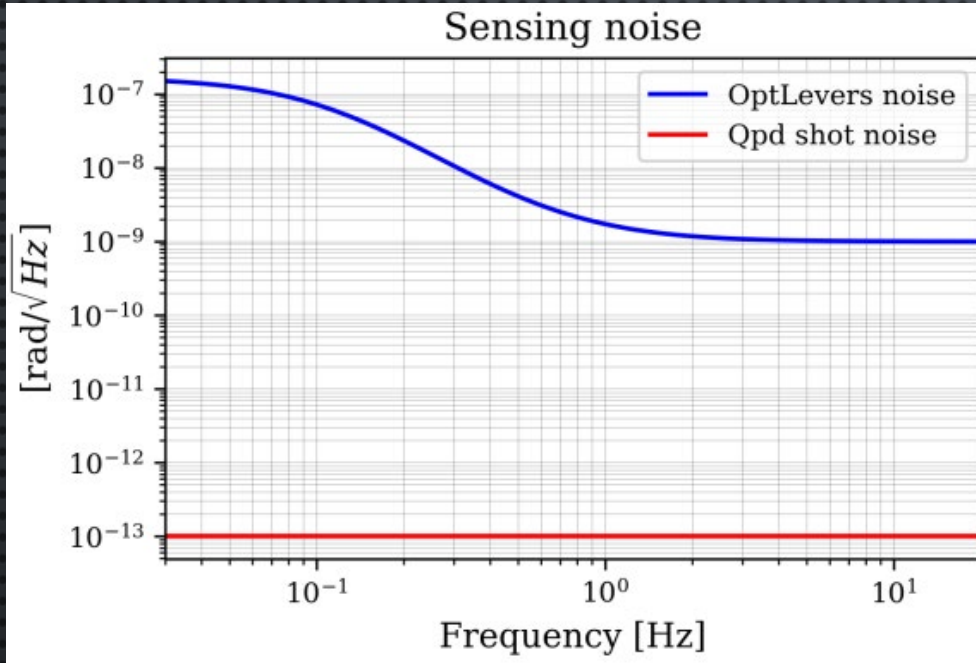


Model:
 Pass $10^{-14} \text{rad}/\text{Hz}^{1/2}$ hard-mode sensor noise through a

- 1) Simple stable controller
- 2) Marionetta actuation torque to test-mass pitch including the shift of resonances due to optomechanical coupling

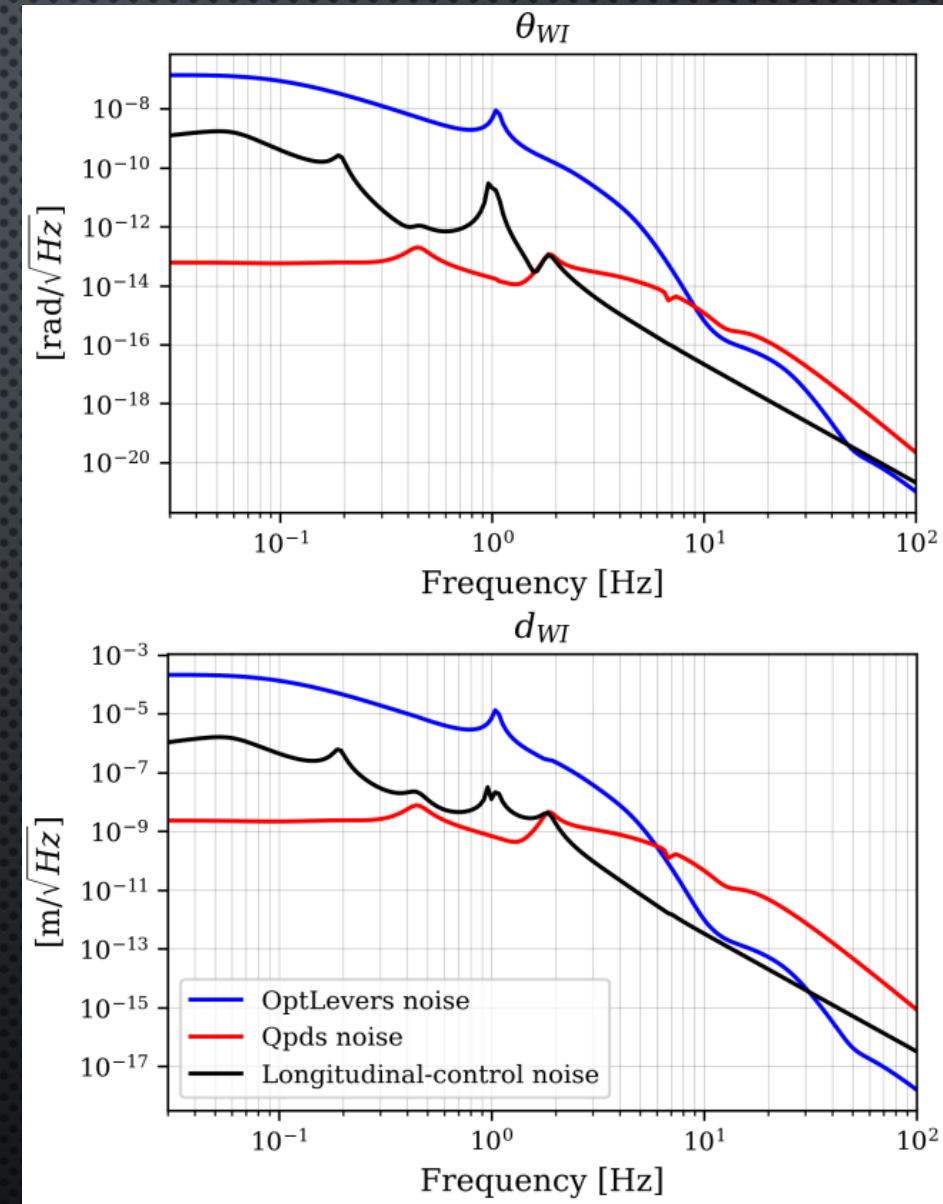
A Basalaev

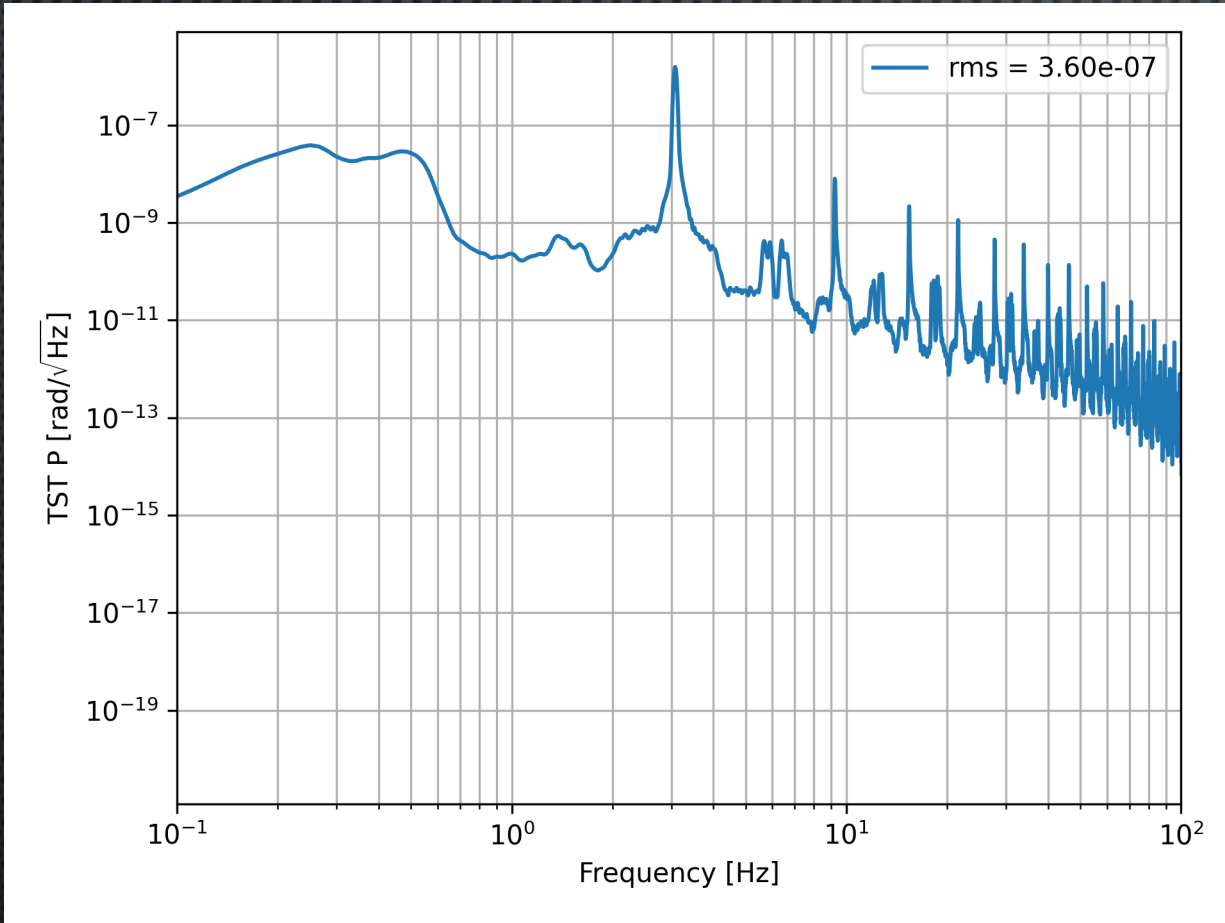
FINESSE: NOISE PROPAGATION IN ADV VIRGO



Length Beamspot Angular

$$x(\theta(\eta)) = d(\theta(\eta)) * \theta(\eta)$$





Notch in the controller at the wrong place (10Hz instead of 3Hz).

Seismic noise inputs to the Marionette as for penultimate state in LIGO.

T Andric

WHAT HAVE WE ACCOMPLISHED IN THIS WEEK?

- A group of people has formed with the commitment to continue the work on angular-controls modeling for ET. Regular meetings are planned.
- Angular controls is a complex problem to simulate, and discussions at the angular-controls session were crucial to propagate the knowledge of various experts inside this group.
- Spicypy, Finesse, and Lightsaber were all identified as appropriate tools to analyze, simulate, and design ET angular controls.
- The Marionetta & test-mass suspension models and actuation scheme are basically understood for ET-LF, and future development of the design can easily be followed with our simulations.
- First calculations were done: noise propagation through the angular-controls system, angular rms requirement, full representations of simplified angular controls and plant models in frequency and time-domain simulations

WHAT ARE THE MAIN QUESTION MARKS AND OPEN TASKS?

- Refine noise models (vibration, readout, actuation)
- Understand whether substantial modifications of the ET angular controls are necessary compared to Virgo
- Calculate optimal controllers and analyze robustness of the performance to plant variations
- Add more details to the suspension model, imperfections of the hard/soft mode sensing, analyze coupling to length control,...

WHAT ARE THE NEXT STEPS?

- Reproduce all results currently only available for LIGO and Virgo to ET-LF (all necessary information is available for a first model)
- Set up regular (once per month?) meetings of the angular-controls simulation group
- Insert this simulation group in the ISB structure maybe as an «interface» group between WPs