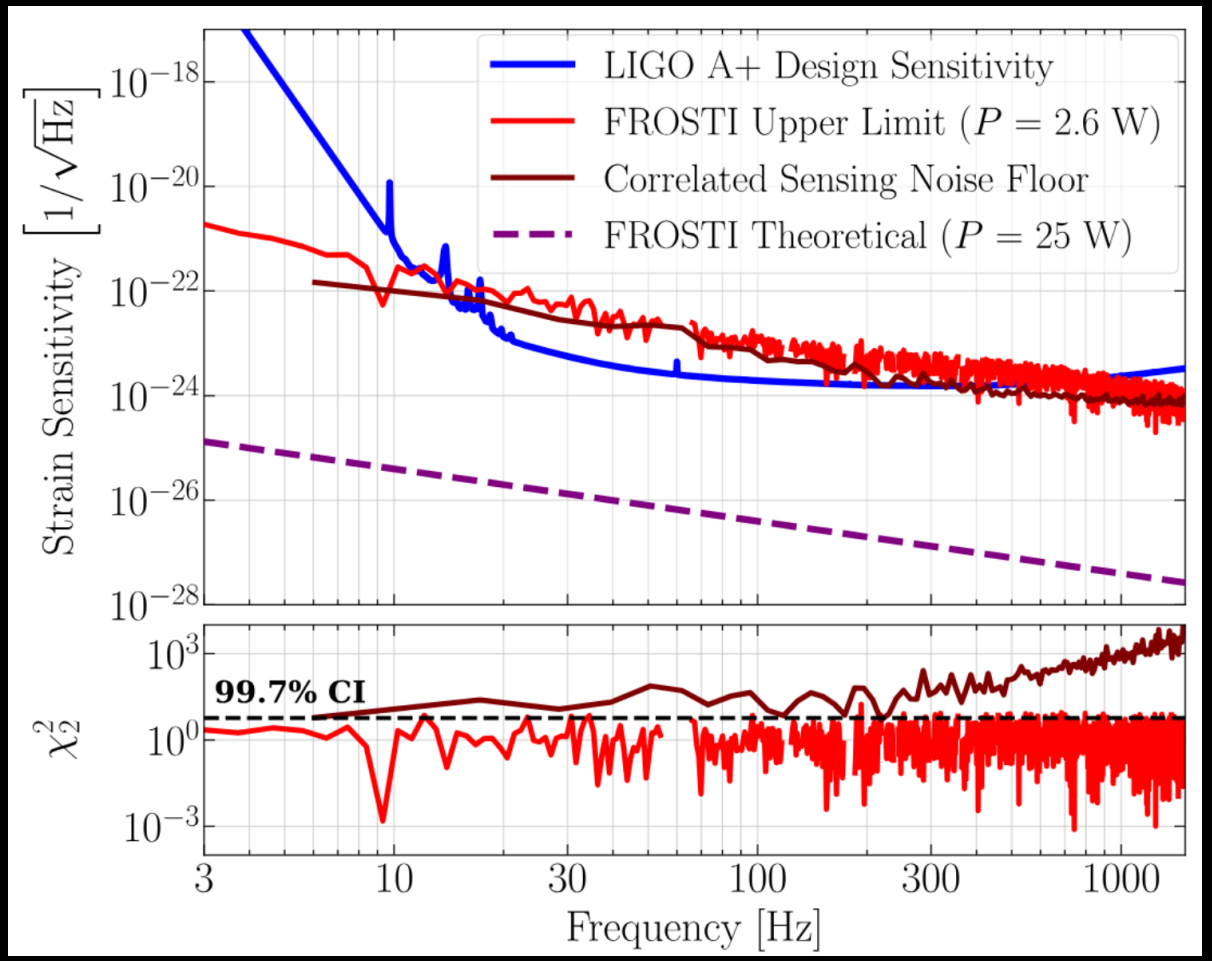
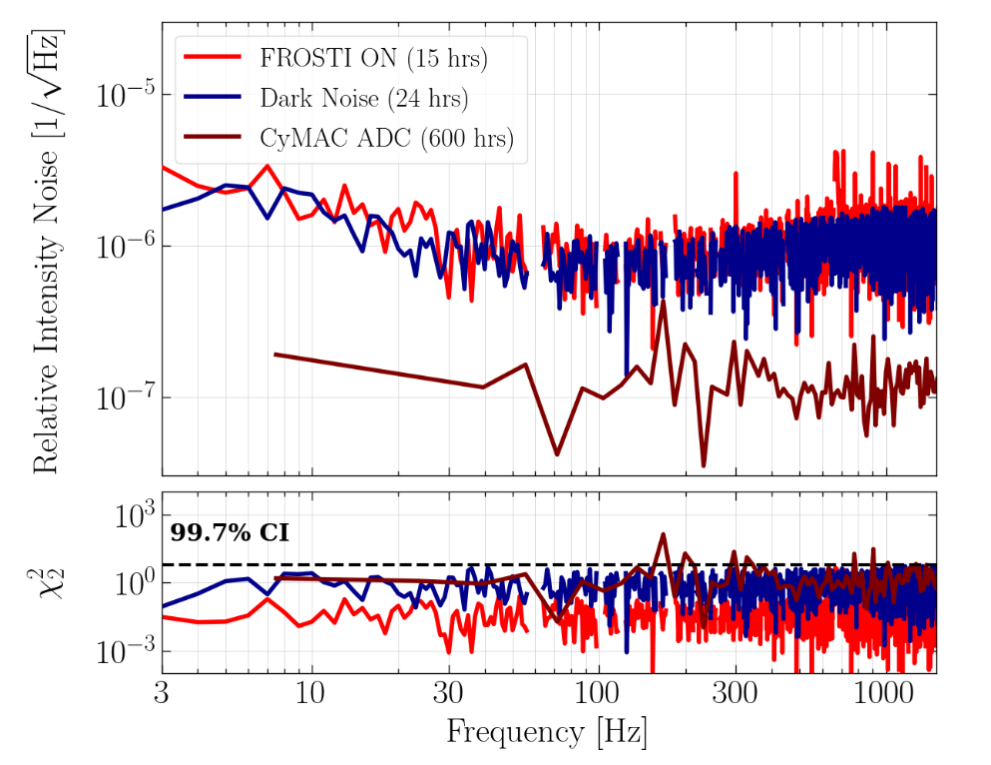
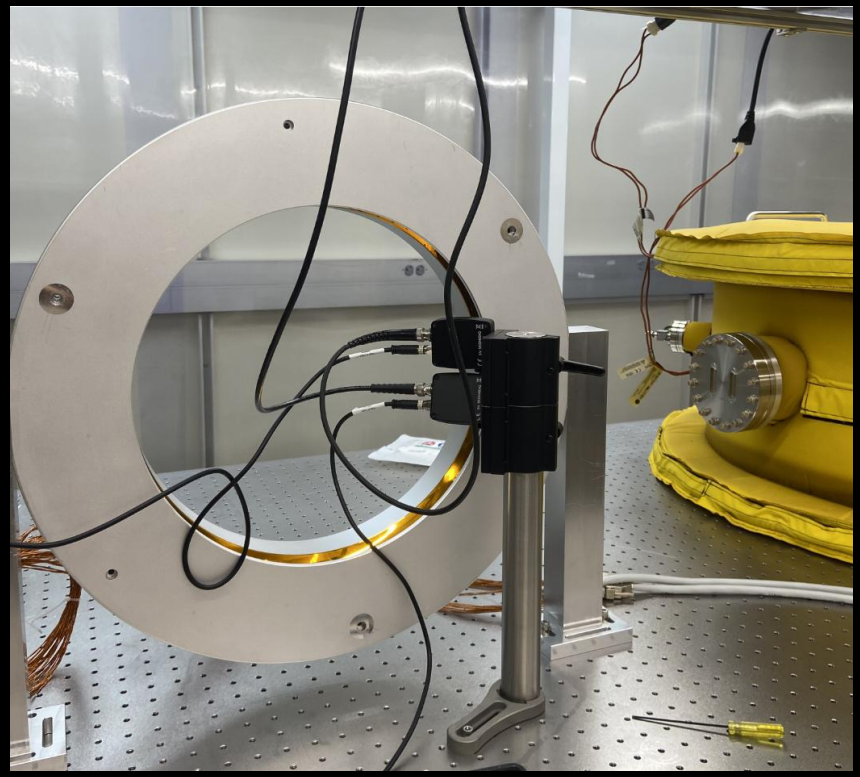


We want to place a better upper limit on the Relative Intensity Noise (RIN) of FROSTI.

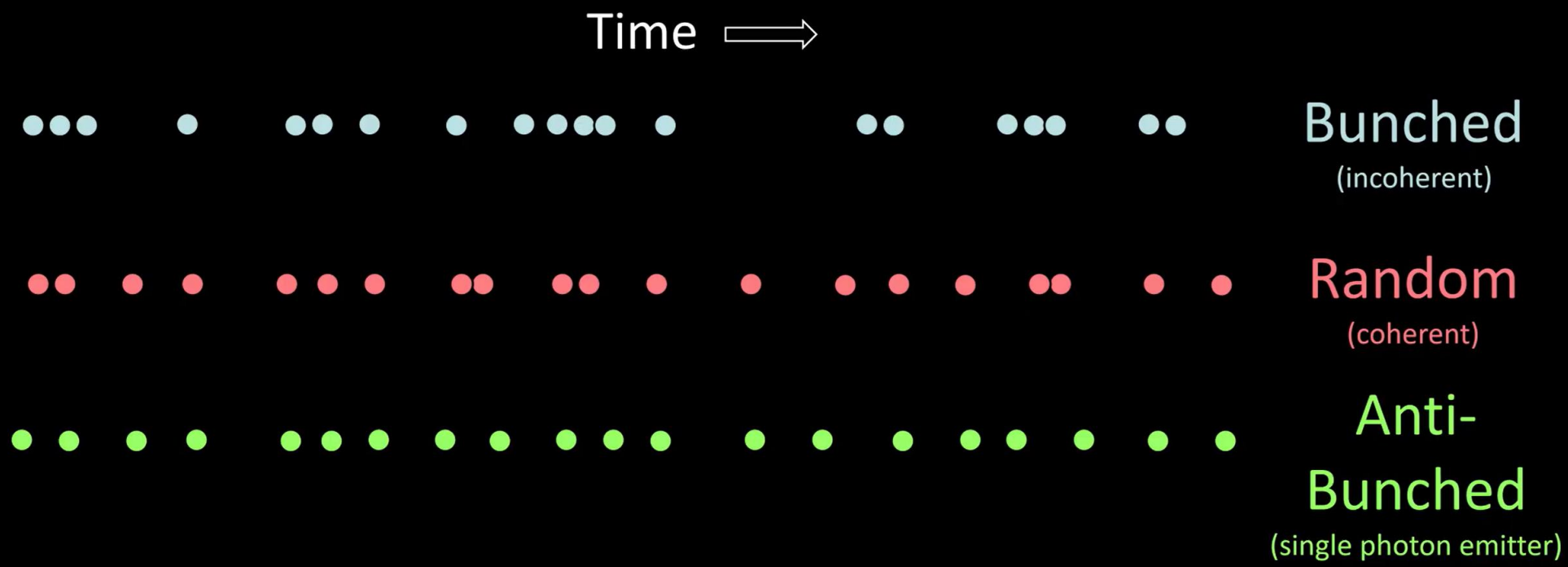
Rosauer et al. 2025





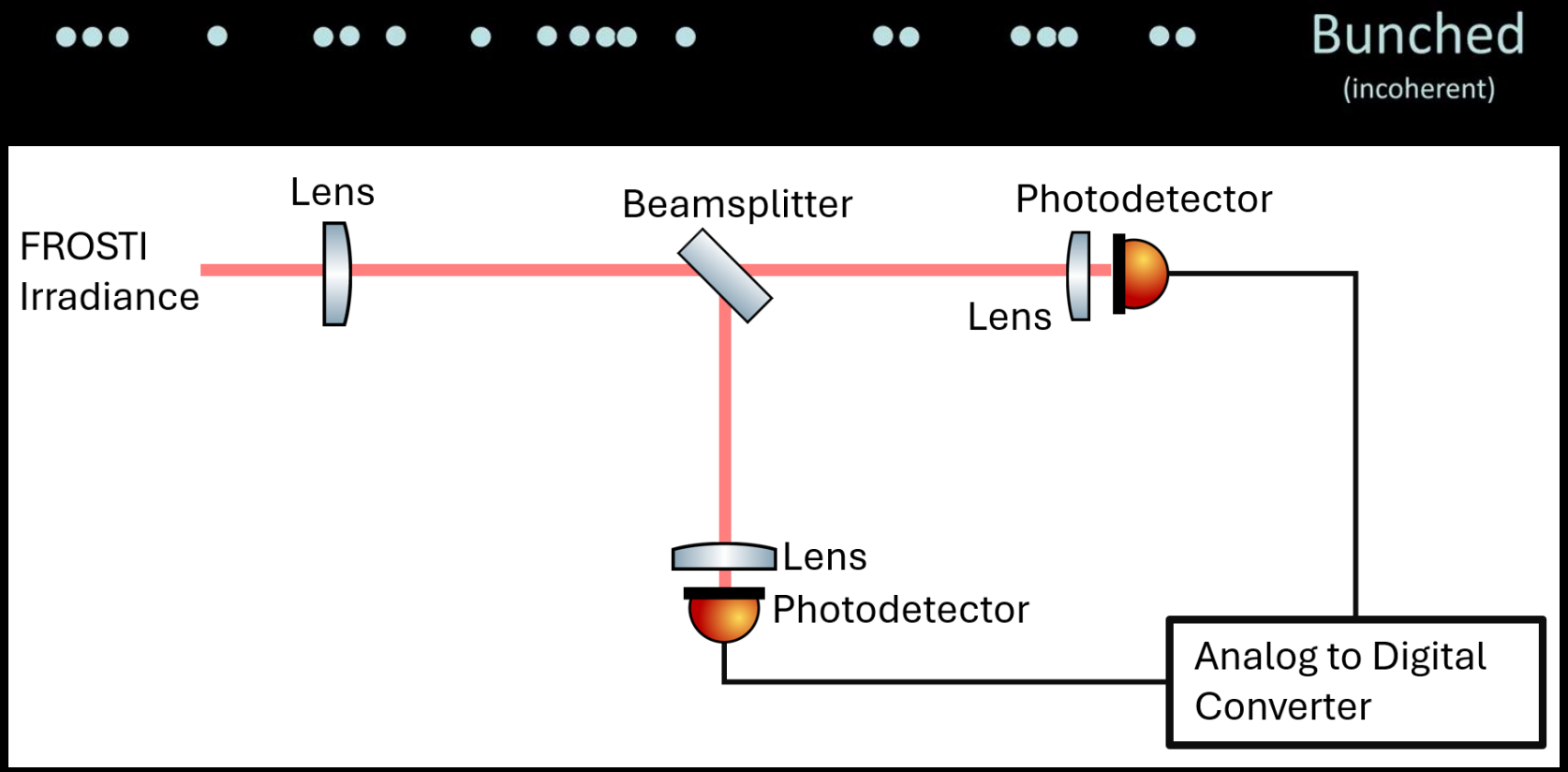
This project builds on previous SURF student Christina Caride's work to characterize the noise performance of FROSTI.

LIGO-T2500091–v1



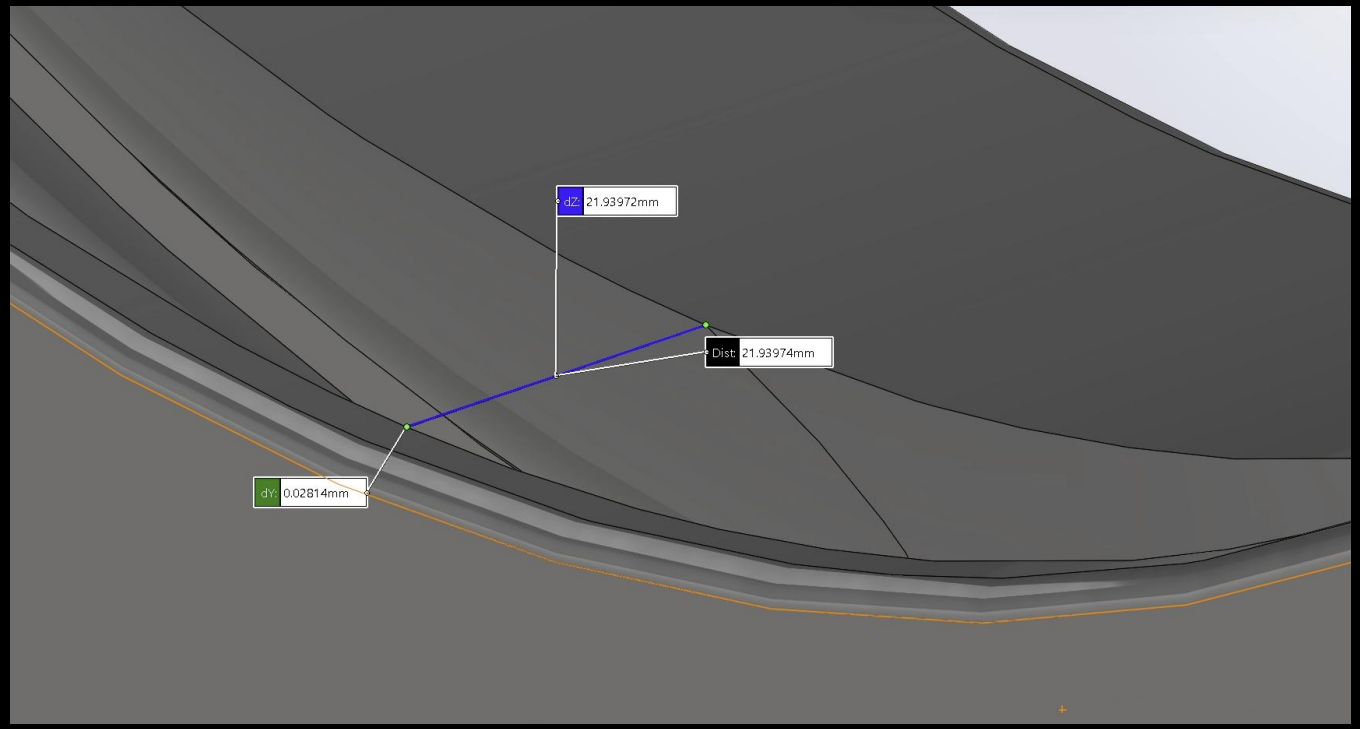
Idea: Photon bunching is a very small effect that lies just above the shot noise limit. If we can measure this, it would prove that FROSTI can operate near its theoretical noise limit

Huygens Optics



We want to measure this using an **Hanbury-Brown-Twiss apparatus**. When a bunch occurs, it is statistically likely that the photodiodes will see a ‘spike’ in voltage readout at the same time. **The amplitude of the CSD will spike at frequencies where they are correlated.**

Huygens Optics



We would like to image the FROSTI opening onto the photodiodes to maximize the power. The aperture is 22mm and the photodetector area is 1mm^2. This gives m = -1/22

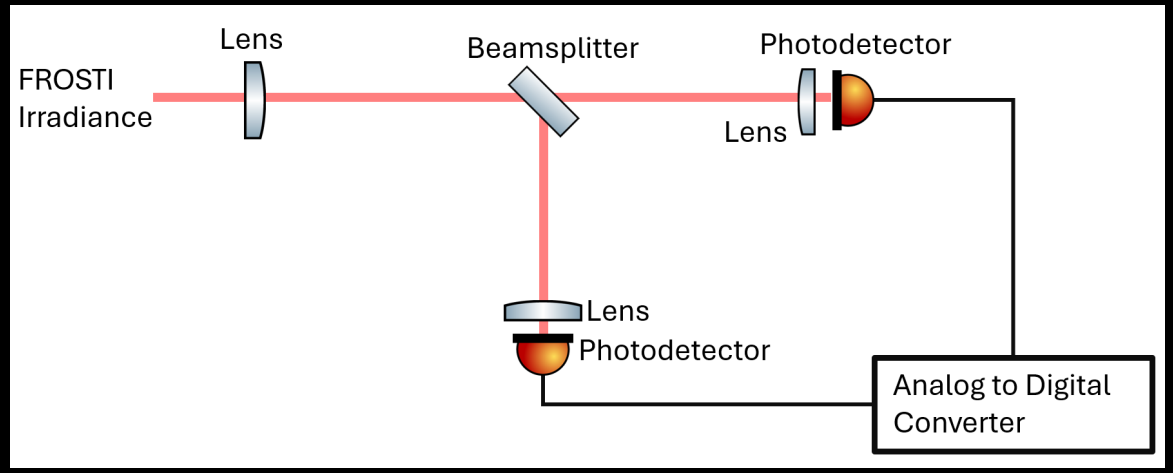
Fits inside the cabinet: (12x35”)

Beam splitter is placed at the focus of Lens 1

Lens 1 placed 3-5 mm from FROSTI

Lens 2 placed <1” from the PD

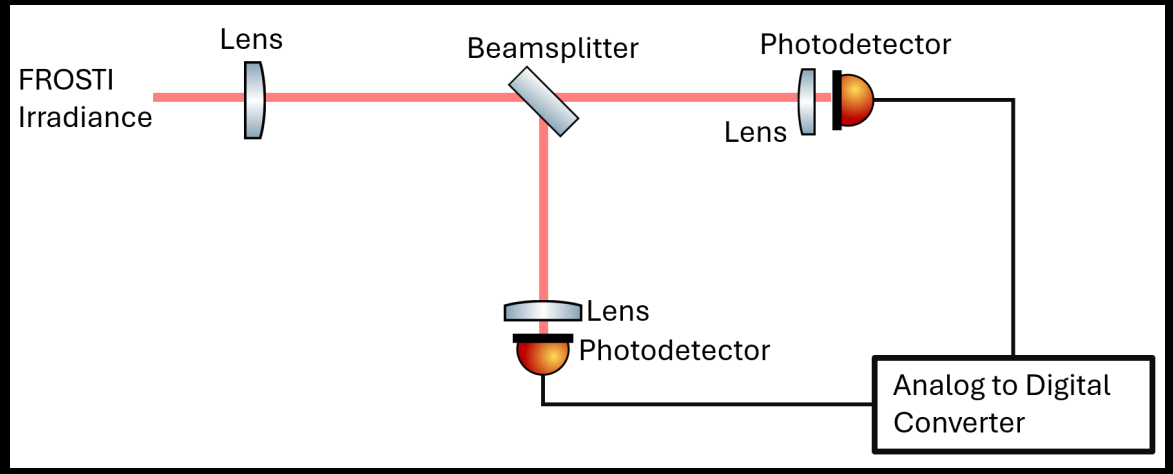
Our Wishlist

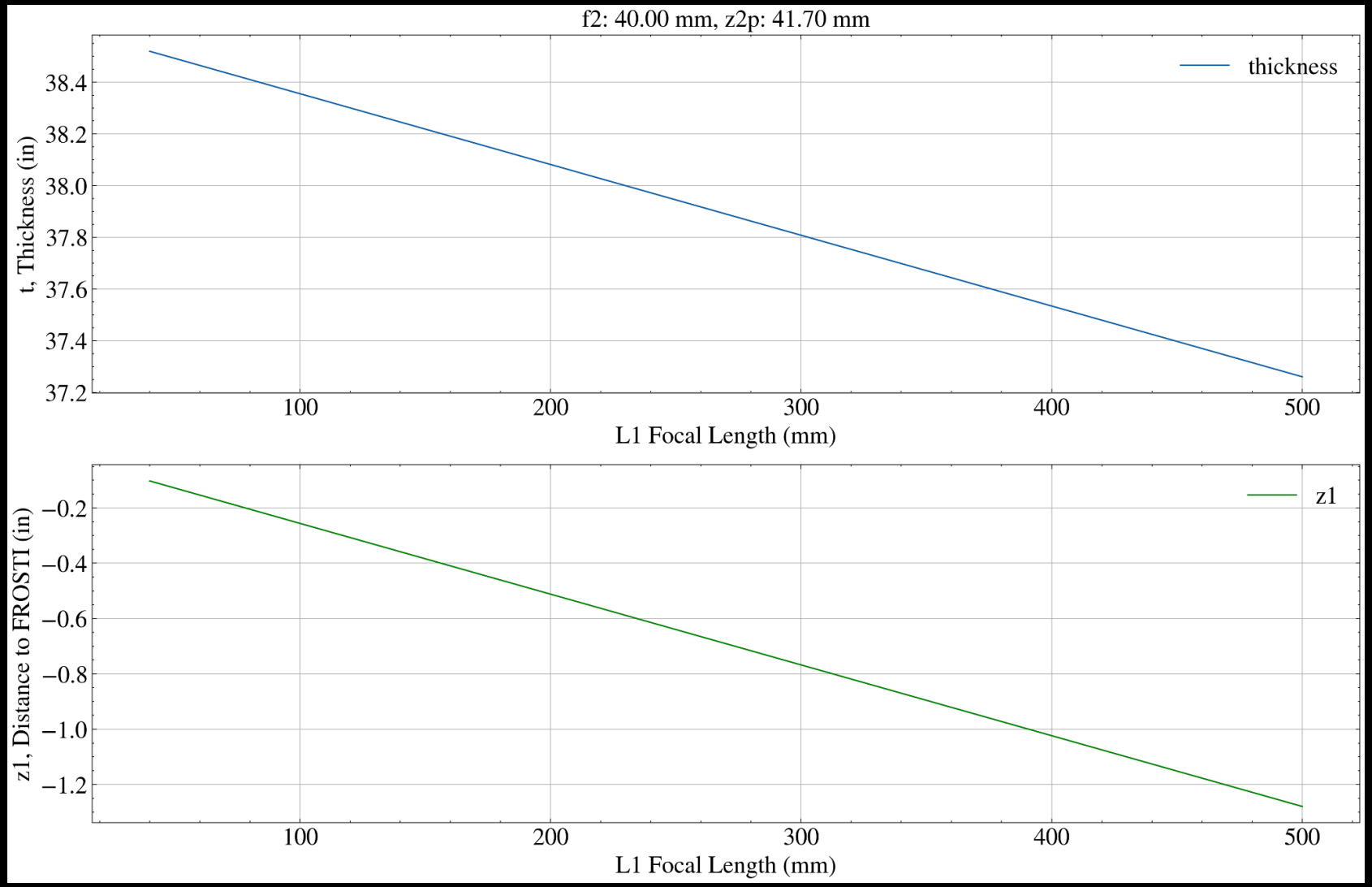


Fits inside the cabinet: (12x35”)

This is hard.

Our Wishlist





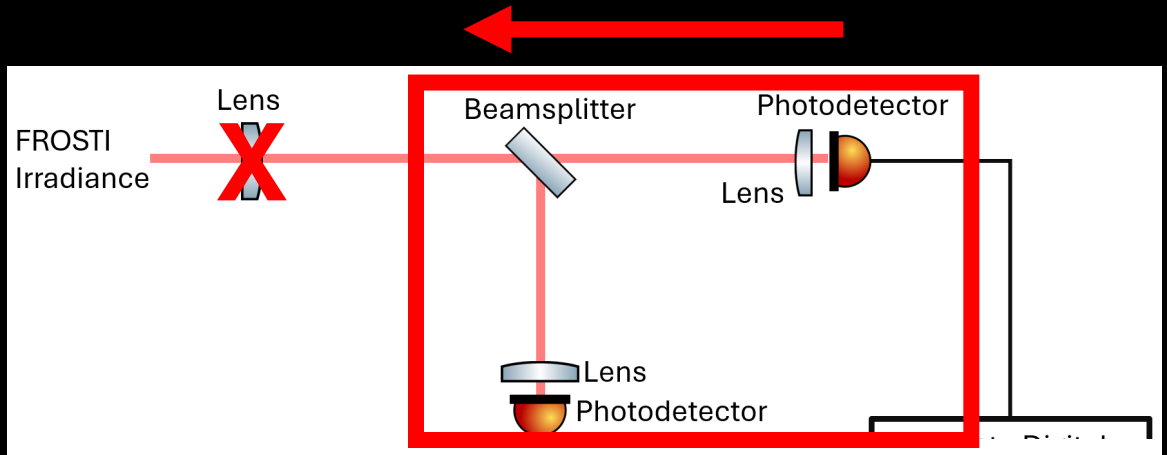
t-f1 and *z1-f1* plots for an imaging system using a 40mm secondary lens with the photodetector 41.70mm from the second lens

No Lens 1 for now, place the beamsplitter at the FROSTI, and see what power we can get.

Fits inside the cabinet: (12x35”)

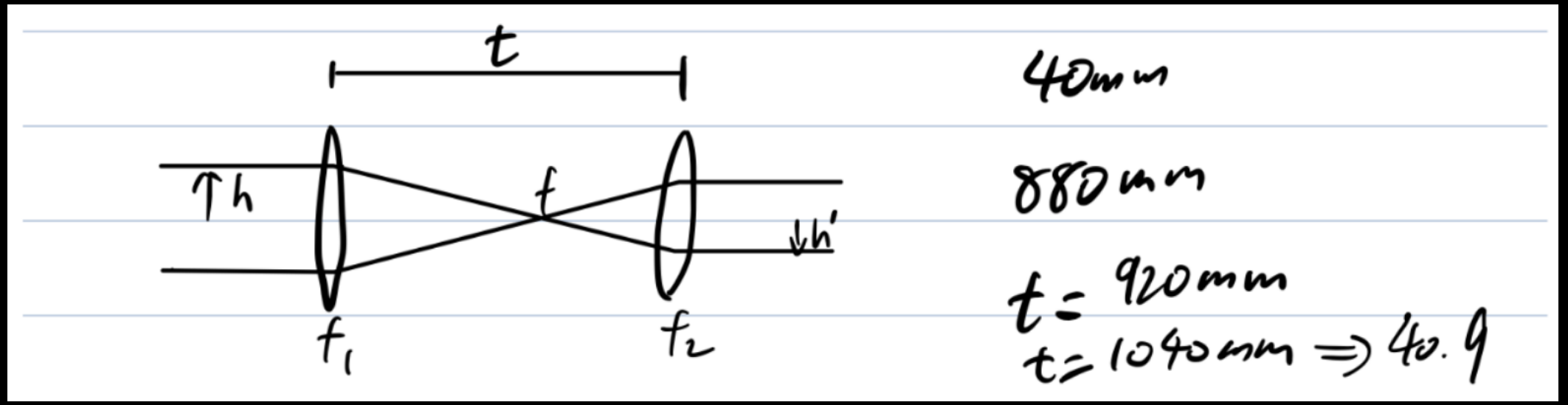
This is hard.

Our Wishlist

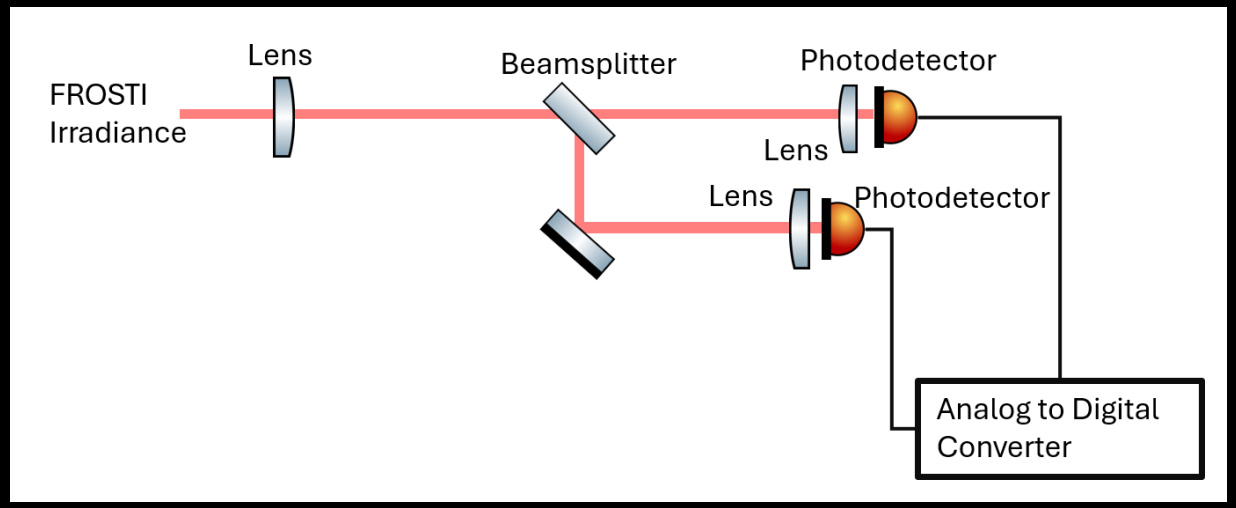


Items		Qty.
	**BSW510**Ø1" CaF_2 Plate Beamsplitter, Coating: 2 - 8 µm, 5 mm Thick	1
	**LA5370-E1** Ø1" CaF_2 Plano-Convex Lens, f = 40 mm, AR-Coated: 2 - 5 µm	2
	**MB8** Aluminum Breadboard 8" x 8" x 1/2", 1/4"-20 Taps	1

Other ideas



Ma had an idea to use an afocal system



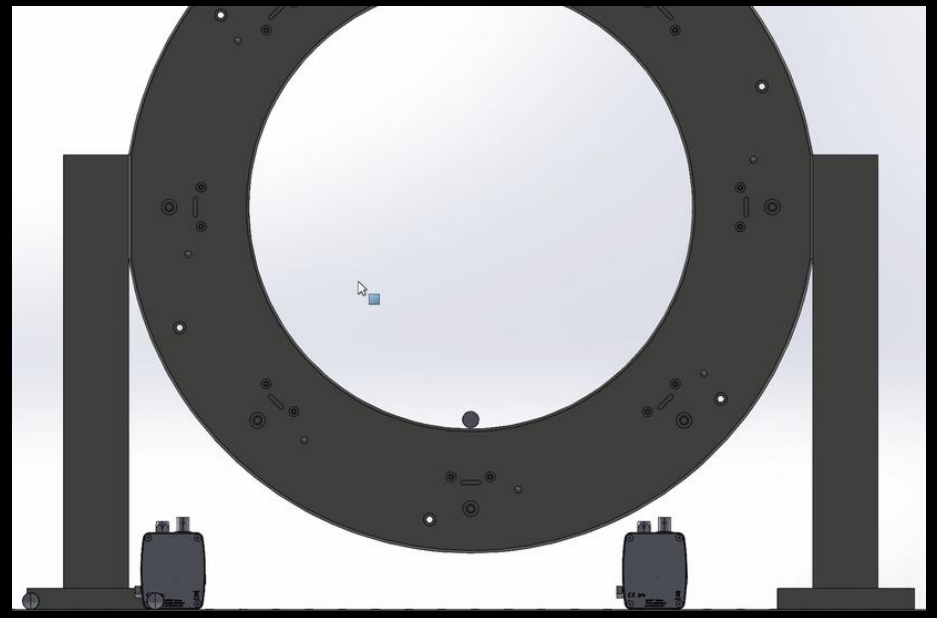
Maybe we could also use a mirror to change the optical path to make the setup fit into the cabinet

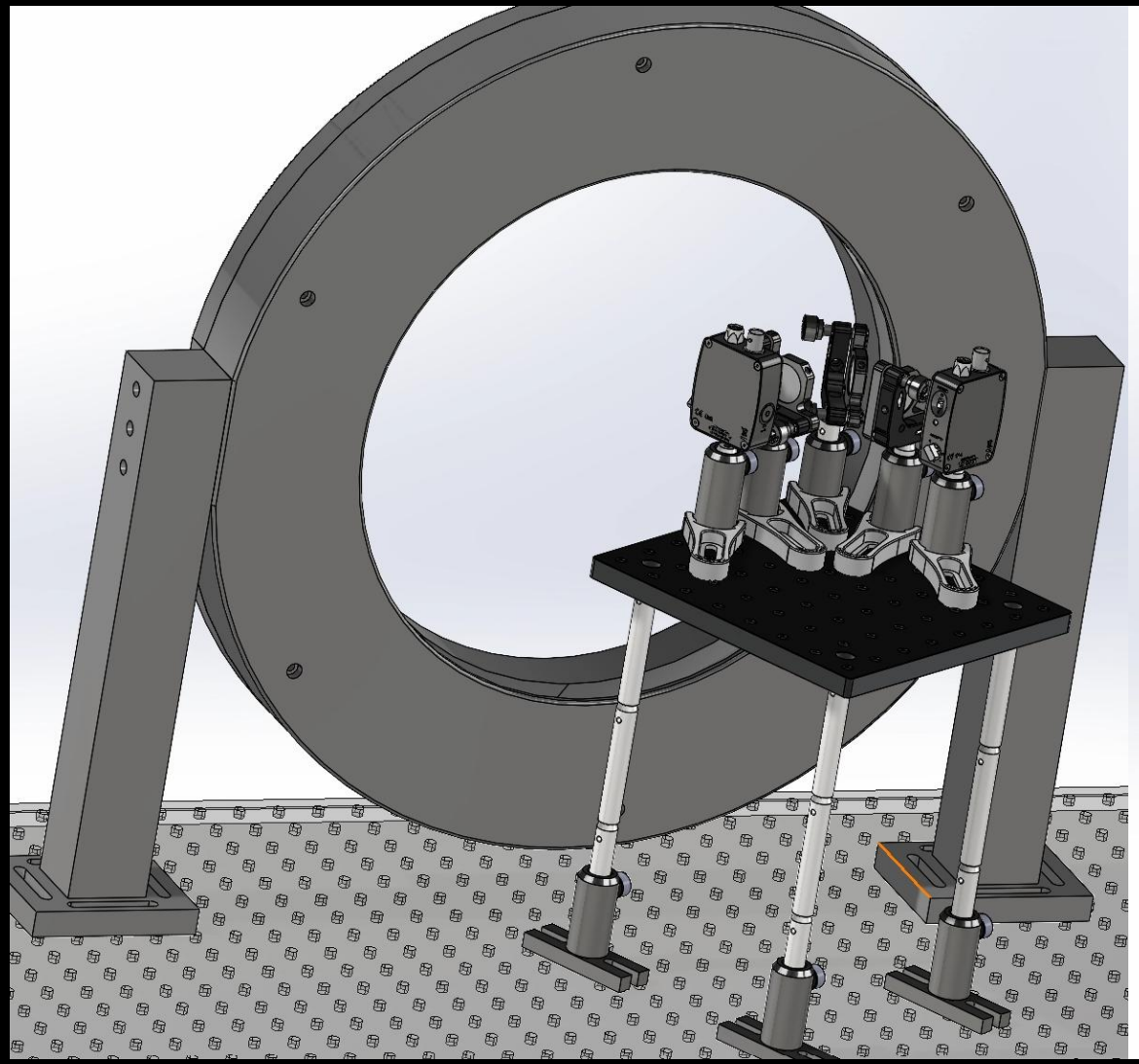
Last week:

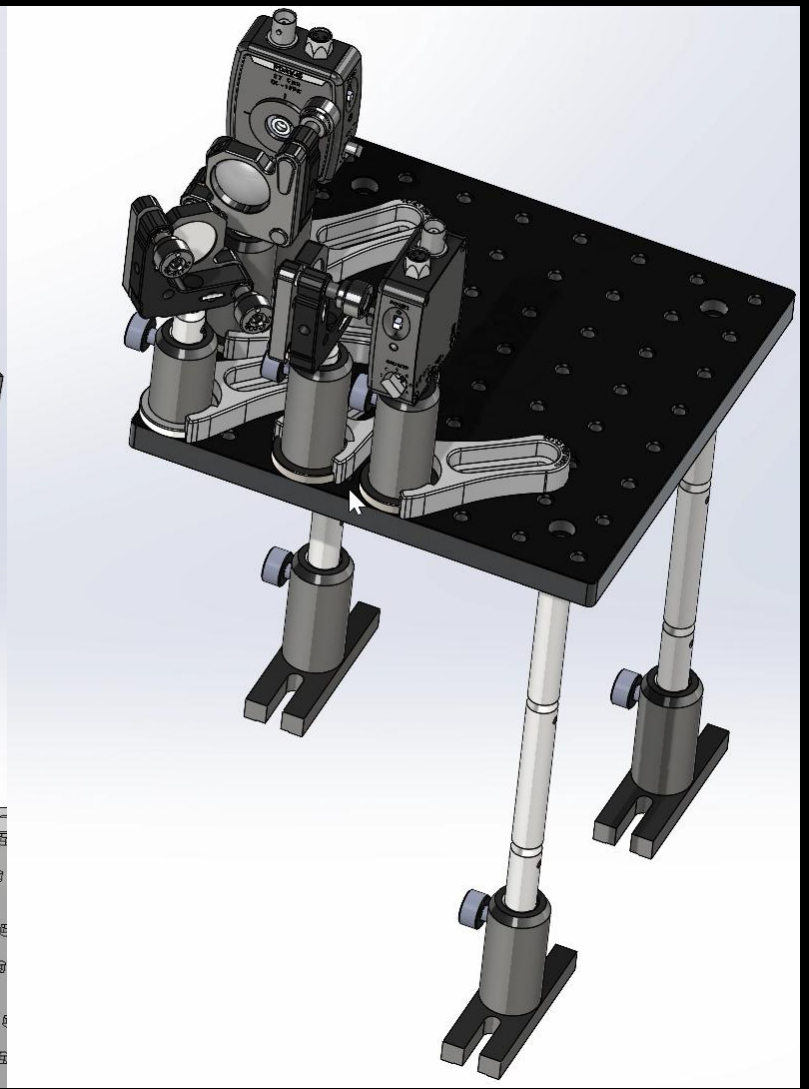
- Attended the LISA Symposium at University of Maryland
- Completed imaging calculations to determine compatible focal lengths/distances
- Decided on an initial configuration using a single lens
- Ordered parts from Thorlabs (which are arrived)

Next:

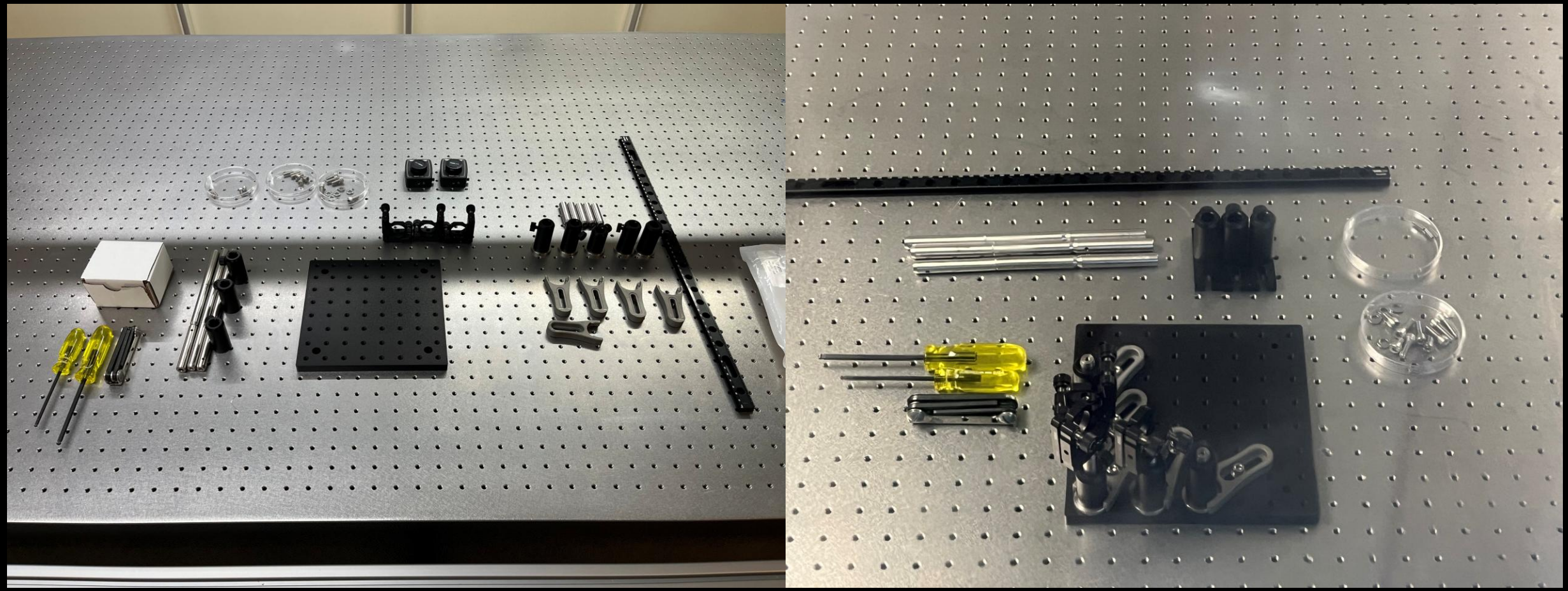
- Solidworks model
- Assemble setup in the lab
- Power measurement
- Theoretical prediction of the CSD







Solidworks model of HBT setup. CAD Viewer: click



Optomechanics have been transferred to the clean room, ready to continue assembly