ACES Interferometer Prototype Update - Week 3

June 20, 2023

1 Setup

Our prototype is a room-temperature, ambient-pressure model that consists of a red laser (635nm) with an absorptive neutral density filter, a moving and fixed corner cube, a beamsplitter, and a camera detector.

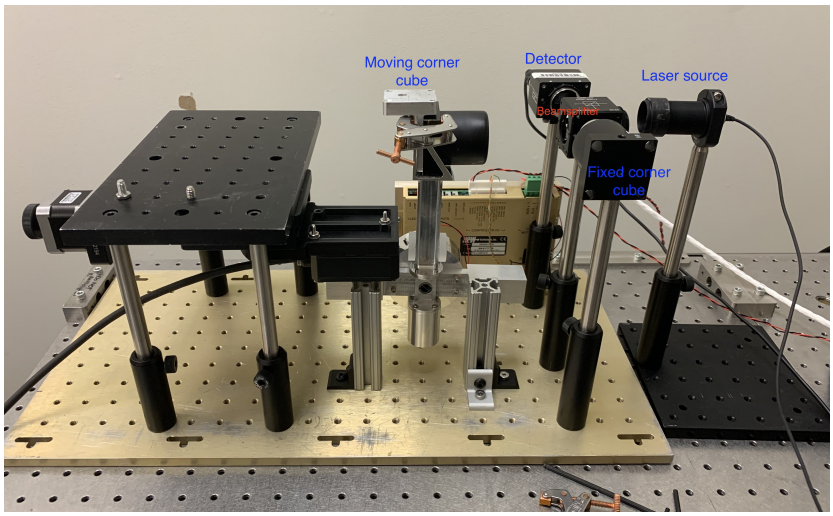

Figure 1: Prototype setup.

Some potential problems with this setup exist:

1. Addition of clamp creates imbalance for moving corner cube - corner cube is unstable and additional weight is added for motor movement
2. Second breadboard was not screwed/attached to main
3. Motor was moving unevenly (potentially exacerbated by added weight) and arm was drifting at best 1µm per minute
4. Initial setup was just on a desk, we found high levels of vibration sensitivity - there was so much movement in the corner cube that intensity oscillation could be detected without even running the motor program
5. The camera was only imaging around 7fps - we want to try to get a faster capture rate

2 Test Data

After aligning the optical elements in the breadboard, we took a 27-frame set of test data to try to observe fringes with the laser. In the data we can see changes of intensity due to constructive & destructive interference of the laser.

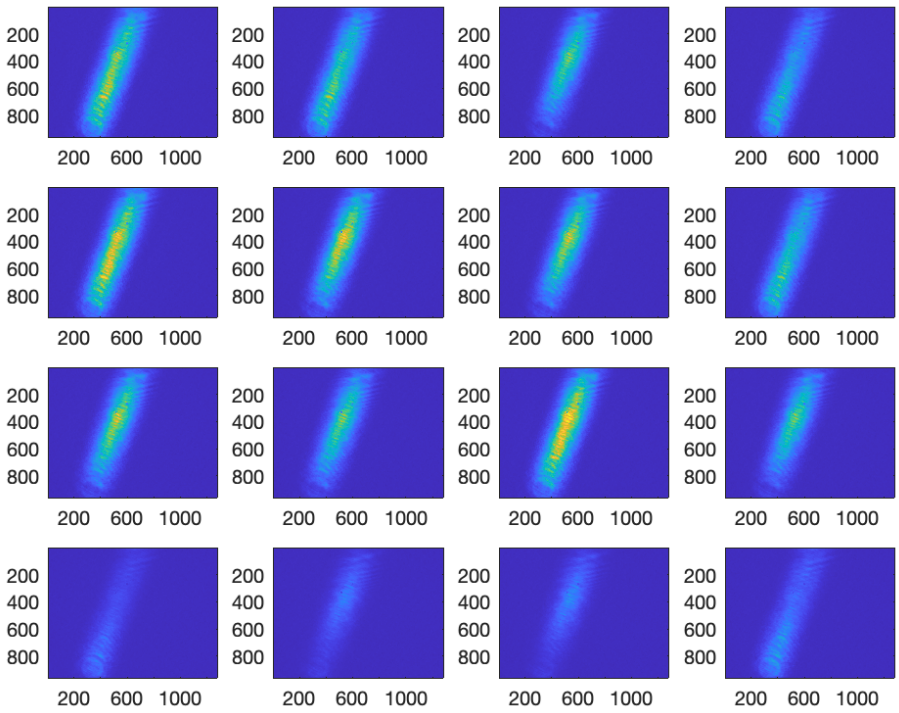

Figure 2: 16 frames of test data.

With these initial measurements, there was a strong presence of vibration in the system due to lack of isolation. However, despite lack of precision, we were able to create a plot of average intensity around the center of the image and see some intensity variation patterns through the frames. After scaling the image intensities (0 to 255), we are able to see some intensity oscillation:

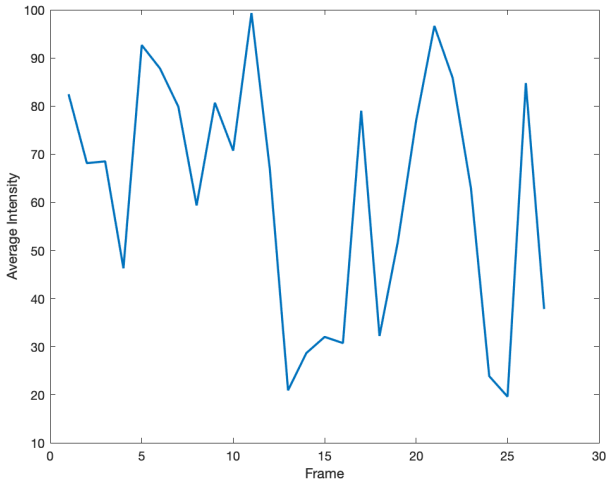

Figure 3: Average intensity varies per frame.