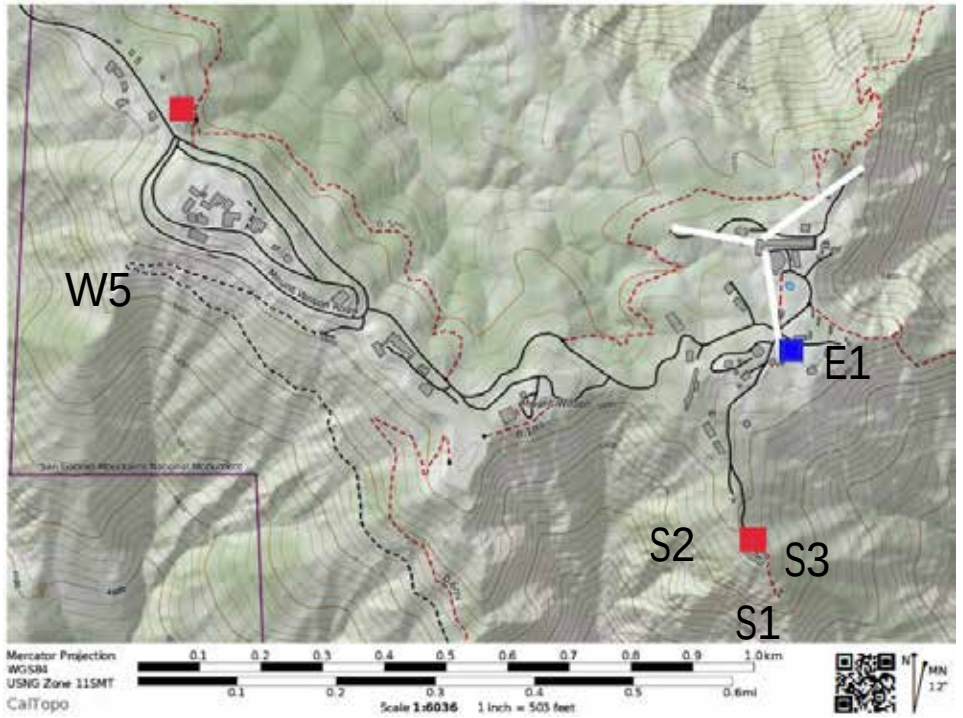
Progress on CMAP: CHARAs transport fiber project

Presented by Rob Ligon

Goals of the Project

Goals:

1. To show the capability to use fibers as the mode of transport for science by getting consistent fringes that can be calibrated for science use.
2. Build a mobile telescope with fiber transport to allow baseline flexibility to extend our capabilities.
    - S1-S2-S3 baselines: ~ 20 m
    - E1-S4 baseline: ~ 600 m
    - E1-W5 baseline: ~ 1100 m

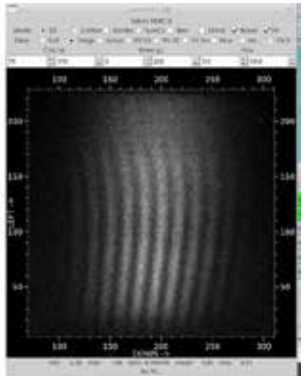


Topo map of CHARA

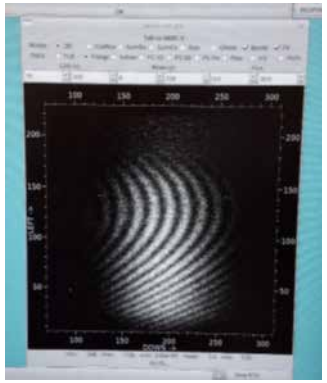
Where we were last April

Test to see if unspooling one fiber would affect the dispersion
Lab test

Before unspooling

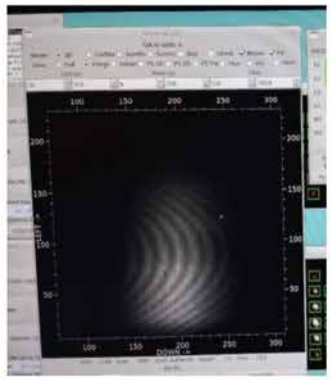


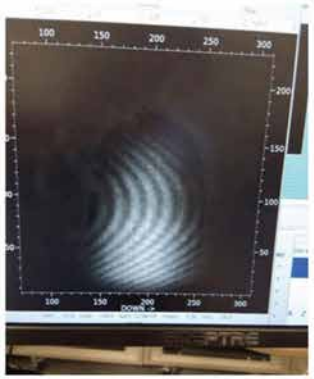
After unspooling



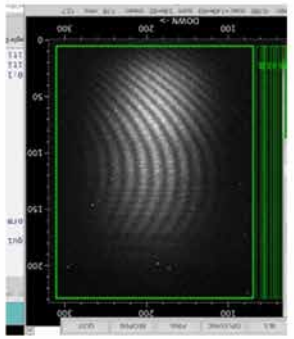
Unspooled fiber

F1/F6 outside 11/14/2024





F6/S2/W F1/S1/R -0.122



Fringes left/right (outside/lab)

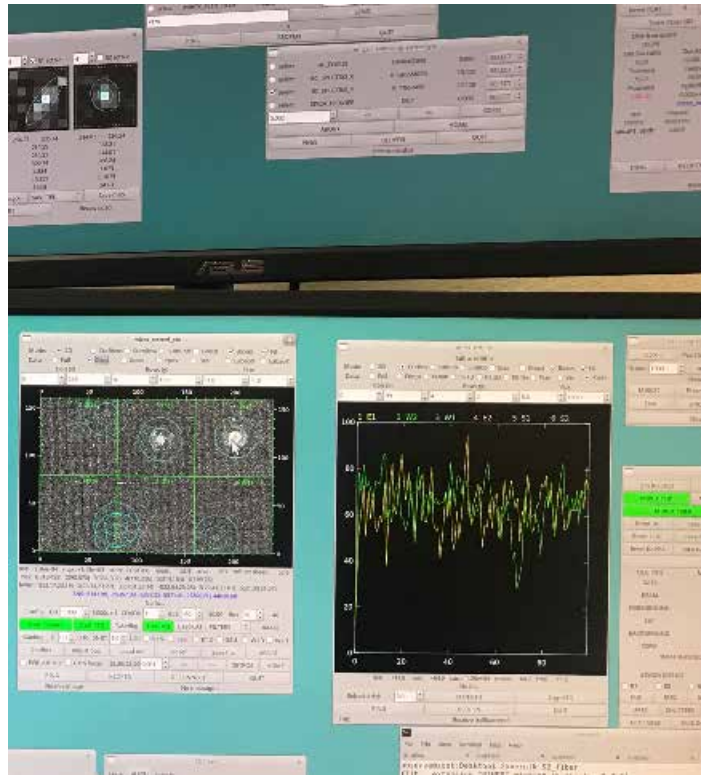
Progress since the last meeting

We had 4 observing runs
June 28-30, 9/25-26, 11/3-4, 12/6-7
Able to get star light but no fringes
Fringe visibility from outside tests have degraded

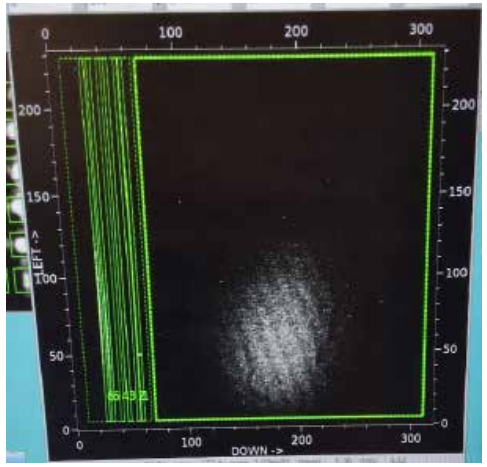
June Run

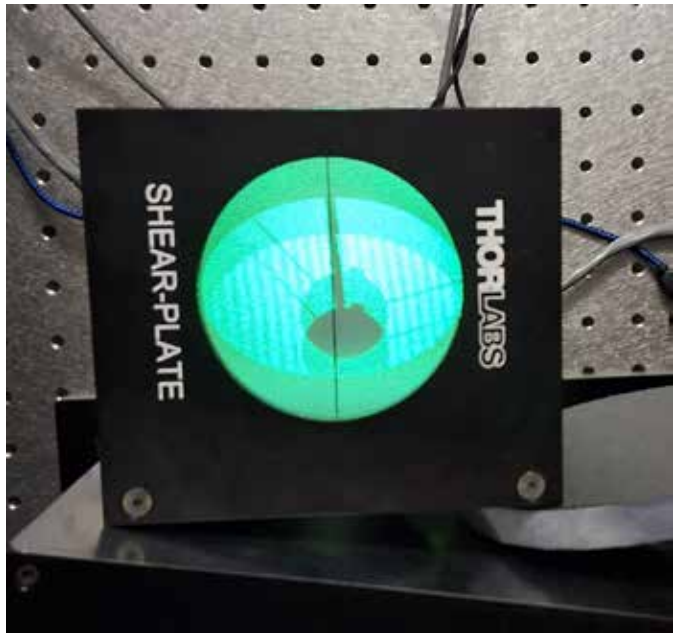
Summary

- Collimator pupil alignment for S1, 1.5 years, drifted for slightly astigmatic image
- Only got S1 coupled on the first night
- Got S2 coupled on the second night but S1 coupling went down
- Removed fiber collimators from the lab and realigned on the third night
    - Dichroic alignment drifted leading to misalignment into the science fiber
        i. Best coupling -6dBm for S1 and -7dBm for S2: room for improvement
        ii. Drift of ~ 30 arcsec (4 arcmin in AOB space) over 2 days
- Found no fringes on third night



F1/F2 outdoor fringes

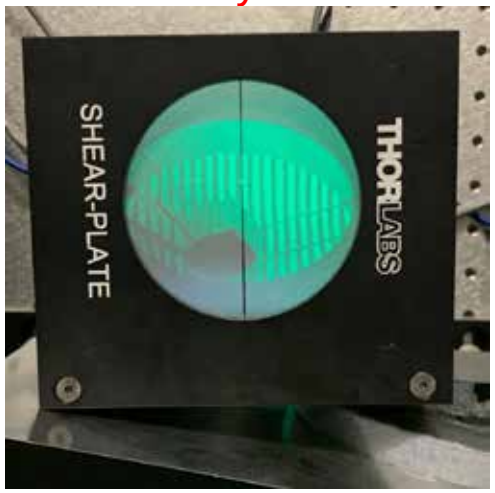


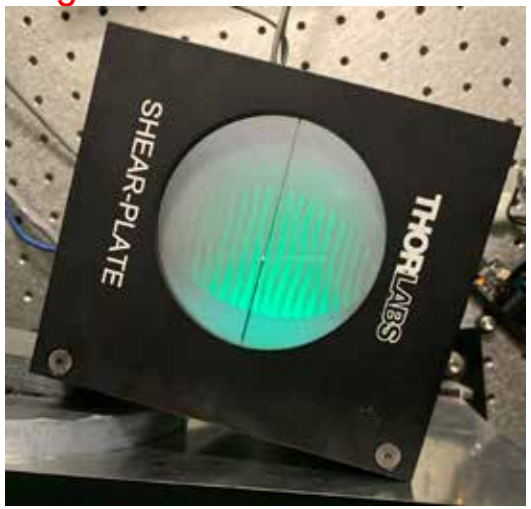


September Run

Summary

- First day spent aligning collimators and injectors.
- First night was lost to high humidity
  - Found high loss on F2
  - Worked on fringe scanning but no fringes
  - Tested search algorithm by Rainer- zaber ok but piezo
- The second day, we checked fringes from F1/F4 and once found decided to use F6 rather than F2
- The second night had high humidity till the wee hours of the morning.
- Noticed the visibility of F1/F6 was not so good.



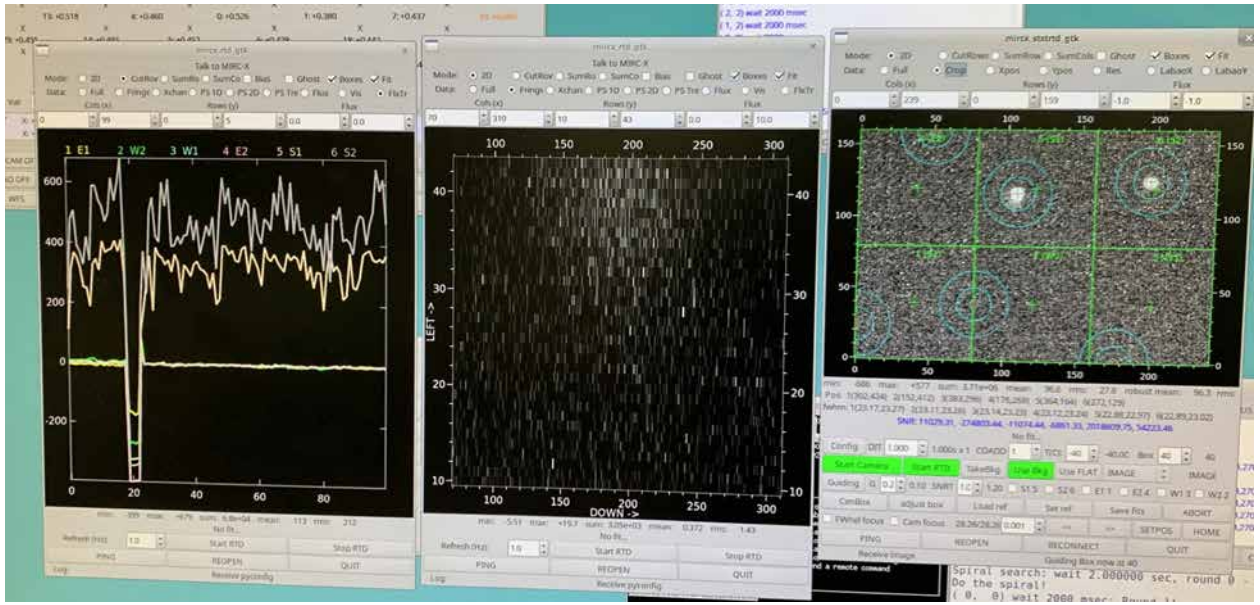


Got an image of F1/F6 fringes?

November Run

Summary

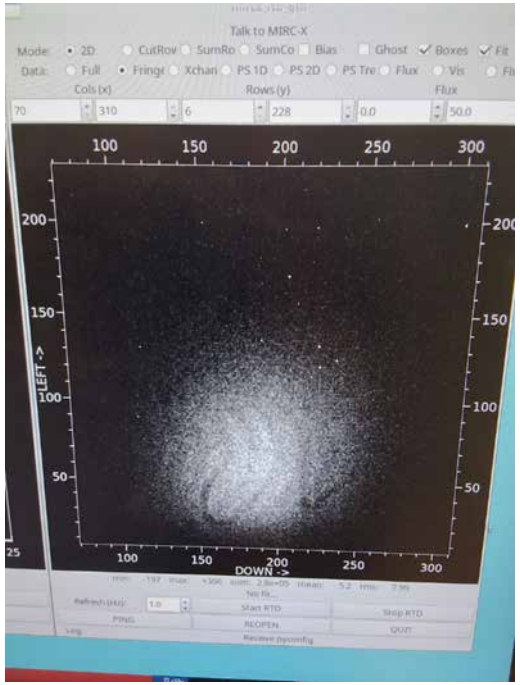
- First day spent aligning collimators and injectors.
- Immediately got light on first star on S2
- Issues with S1 telao which turned out to be a misaligned dichroic again.
- Once fixed, using G182, we got approximately 200-400 counts on mircx on nominal settings for S1 and 400-600 counts on S2.
- Piezo adjusters not working that well. Saw S2 go up to 1200 counts once. Switch to mirror mount?
- No fringes



December Run

Summary

- We worked a lot on fringe detection and decided we needed a factor of 2 more light given our current visibility
- No luck on run
- Over break, work on fringe visibility



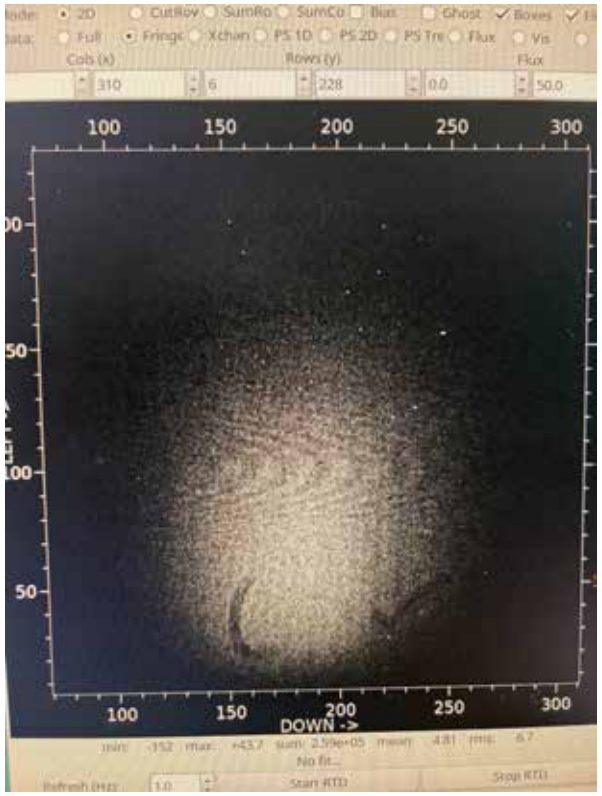
Winter Break

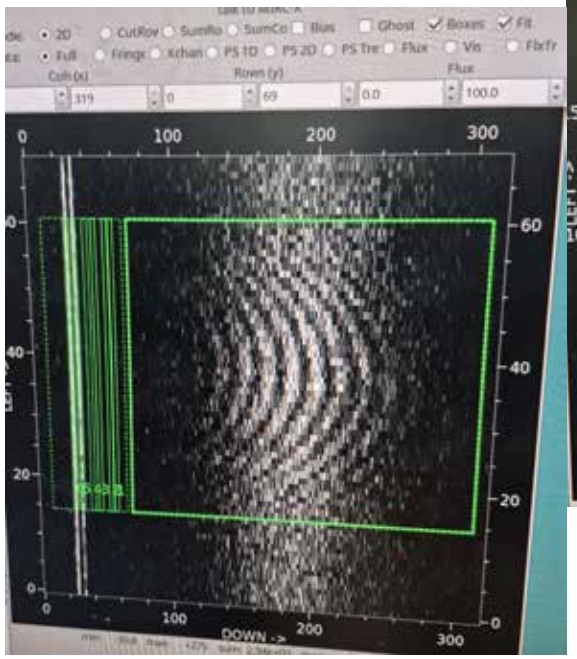
Work on reason for loss in contrast of the fringes

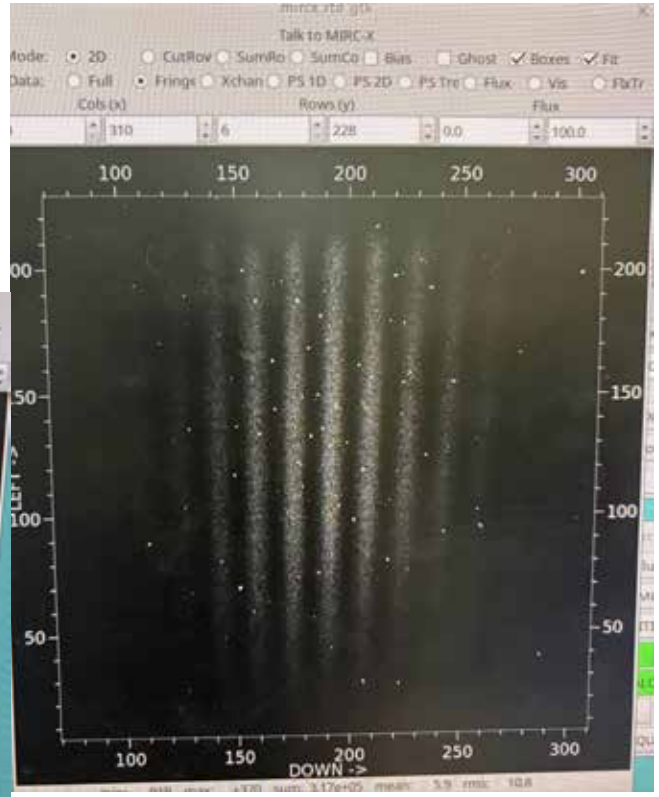
- read smaller part of mircx detector to read out faster
- see if running the camera 3 times faster would allow us to see something
- warm fibers
-use CHARA metrology to measure fiber length changes
-look for vibrations
-when did they start dropping in contrast: experiments were sparse
-unspooling, breakage,...

Speeding up MIRCX

- MIRCX sped up for 1kHz frame rate



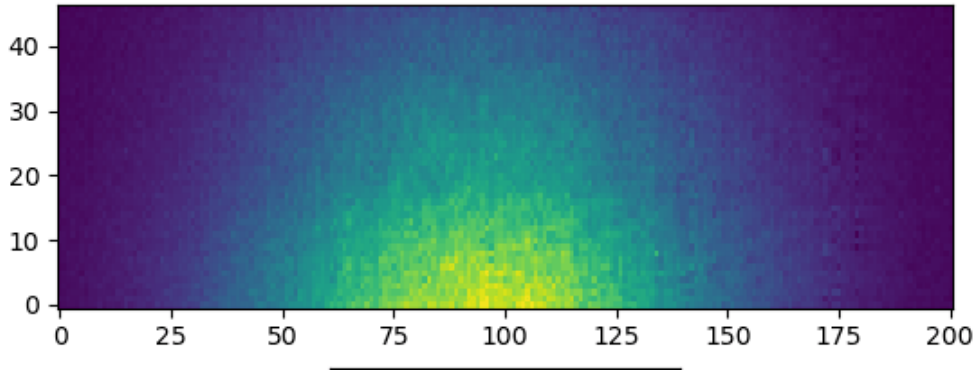




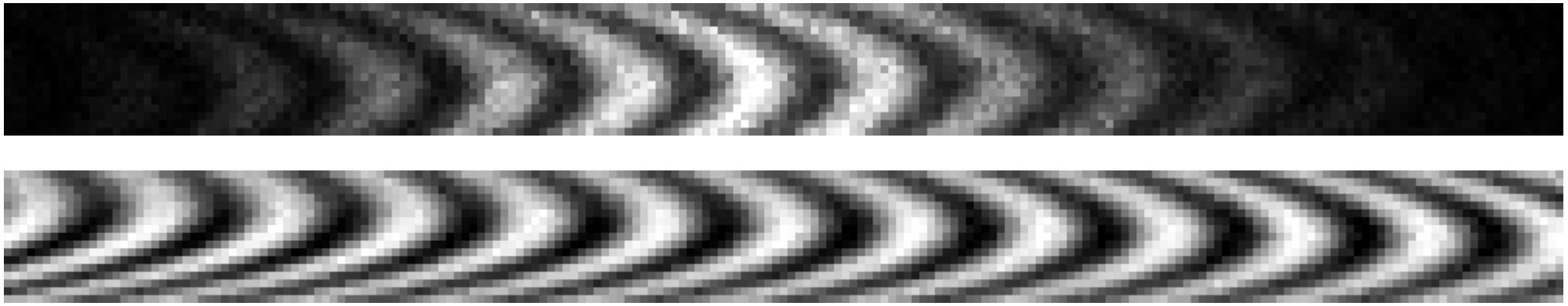
Speeding up MIRCX

- What we found

The frame rate of the camera is 1kHz
Theres 200 frames

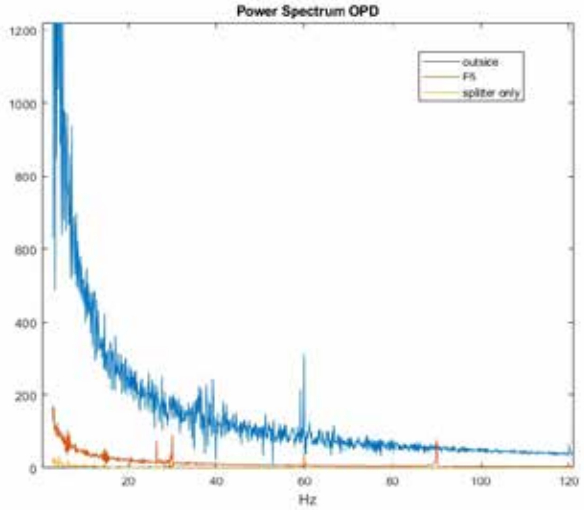


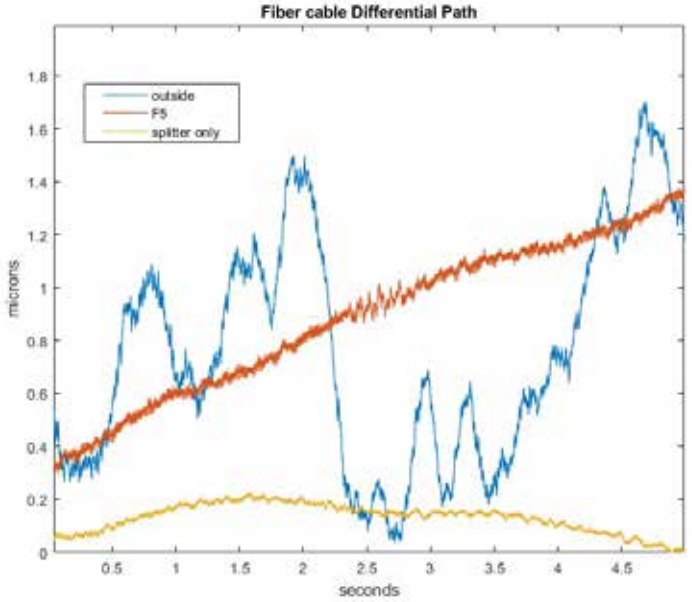
- Narsi took the data and made a simulation



Metrology

Splitter only: used the two polarizations from ople met into a fiber splitter to combine the light. Then injected into a met detector card.
F5: used the F5 fiber on one side of the splitter.
Outside: used fibers on the outside, F1/F4, combined with F5





Future Plans

- Investigate contrast loss more
  - OTDR coming
  - OBR
- Get T7 on-sky
- Find fringes on-sky
  - ?
- S4/E1 fringes