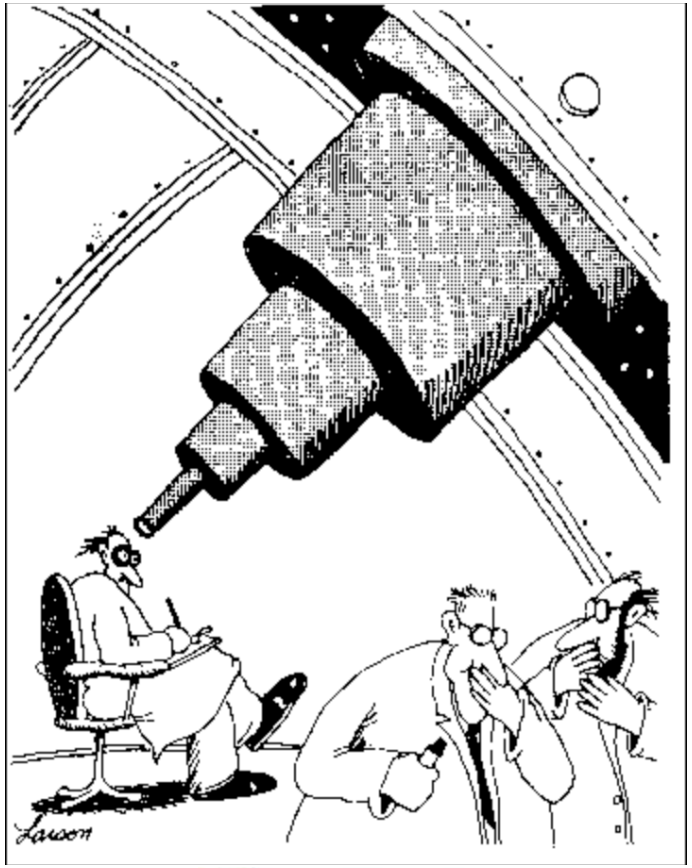
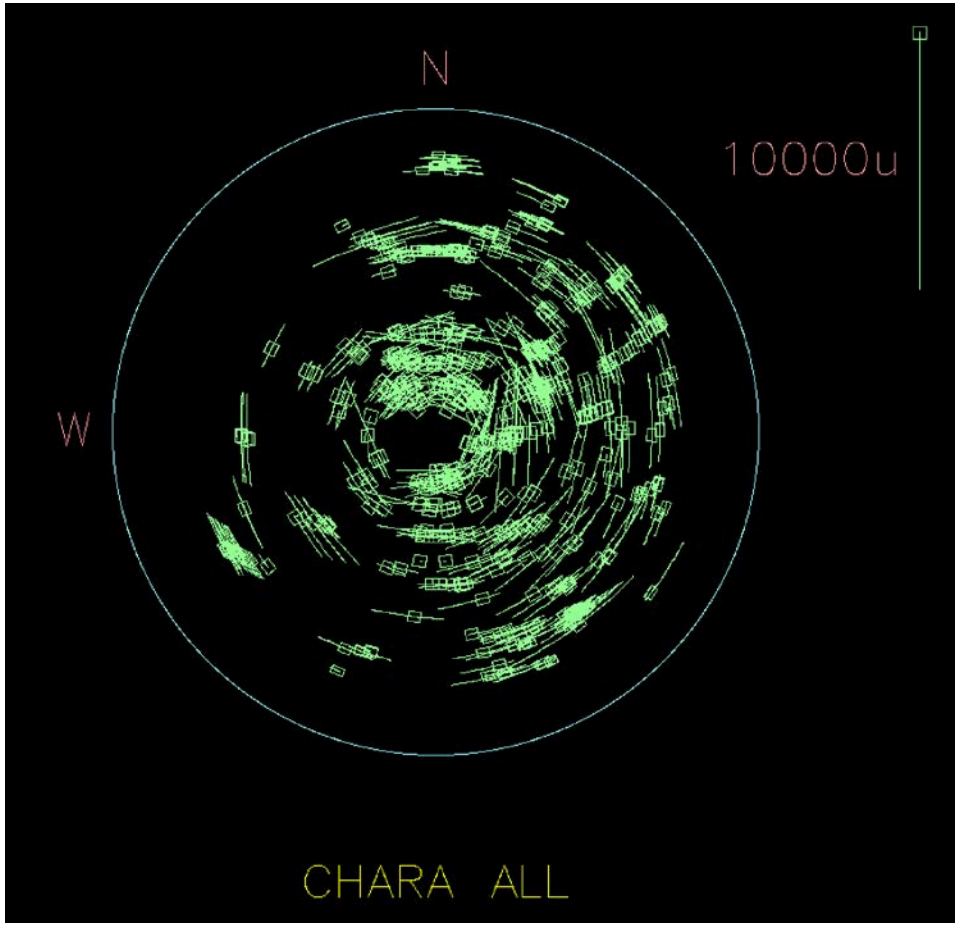
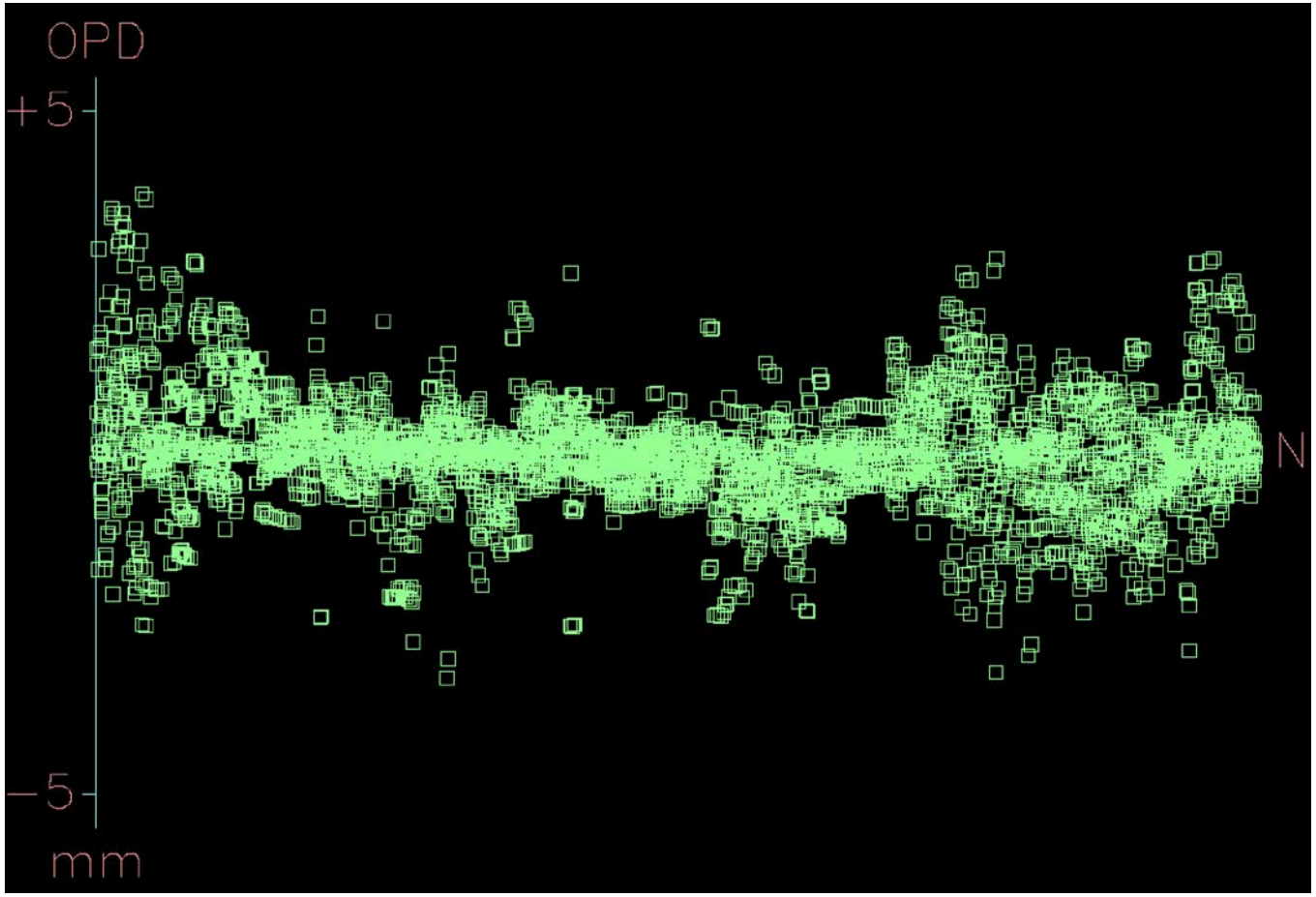
BLS - AO Update - CLASSIC/CLIMB Upgrade

Theo ten Brummelaar



Baseline Solution Update





Data from MIRC only

TELESCOPE DATA FOR S1

XOFFSET	/ -/ / /
YOFFSET	/ -/ / /
ZOFFSET	/ -/ / /
LIGHT	/ -/ / /
POP1	/ -/ / /
POP2	130-714
POP3	,422-3/ 4
POP4	,0/ 86-152
POP5	,521-406

TELESCOPE DATA FOR S2

XOFFSET	,05/ -324
YOFFSET	32-055
ZOFFSET	434-562
LIGHT	788-054
POP1	0/ 8-751
POP2	/ -/ / /
POP3	6/ -572
POP4	,124-651
POP5	,1/ 71-263

TELESCOPE DATA FOR E1

XOFFSET	00-836
YOFFSET	7/ -/ 54
ZOFFSET	010-206
LIGHT	4448-377
POP1	/ -/ / /
POP2	,083-/ 14
POP3	,0/ 6-141
POP4	0017-444
POP5	0144-513

# TELESCOPE DATA FOR E2	
XOFFSET	,165-33/
YOFFSET	,121-482
ZOFFSET	,63-315
LIGHT	,044/ -608
POP1	127-375
POP2	,10-100
POP3	/ -/ / /
POP4	161-164
POP5	0/ 80-302

# TELESCOPE DATA FOR W1	
XOFFSET	,635-881
YOFFSET	,85-124
ZOFFSET	858-220
LIGHT	1305-557
POP1	,10/ / -186
POP2	,044/ -713
POP3	/ -/ / /
POP4	,082-762
POP5	/ -/ / /

# TELESCOPE DATA FOR W2	
XOFFSET	,21-/ / 1
YOFFSET	21/ -463
ZOFFSET	37-7/ 2
LIGHT	4577-437
POP1	/ -/ / /
POP2	/ -/ / /
POP3	/ -/ / /
POP4	/ -/ / /
POP5	/ -/ / /

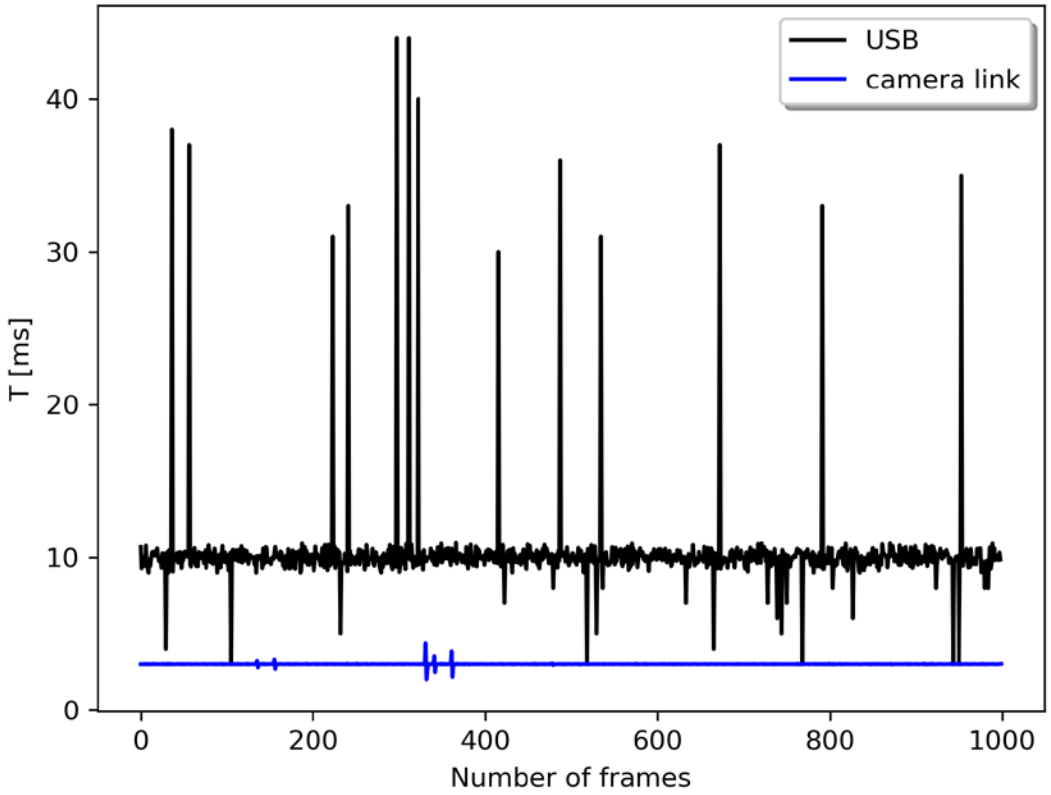
Adaptive Optics Program


From HUT
Lab AO
Focus WFS
Align Beacon
Stop Align
Shut open/close

USB vs camera link

- Requirement ~500 FPS (2 ms atmosphere coherence time).
- Andor USB data acquisition misses 5 frames at 500 FPS frame rate

2 ms integration	Mean (ms)	Max (ms)
Camera link	2.1	3
USB	10.37	60.59



How the software works

Andor wavefront sensor

Frames

Frames

Control

Camera link process

Main server

Deformable mirror

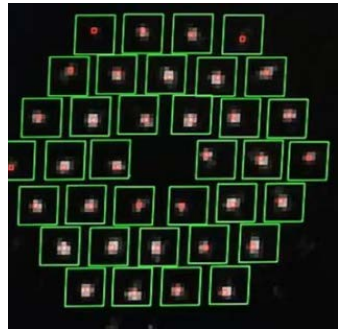
Control

Write frames

Sharedmemory

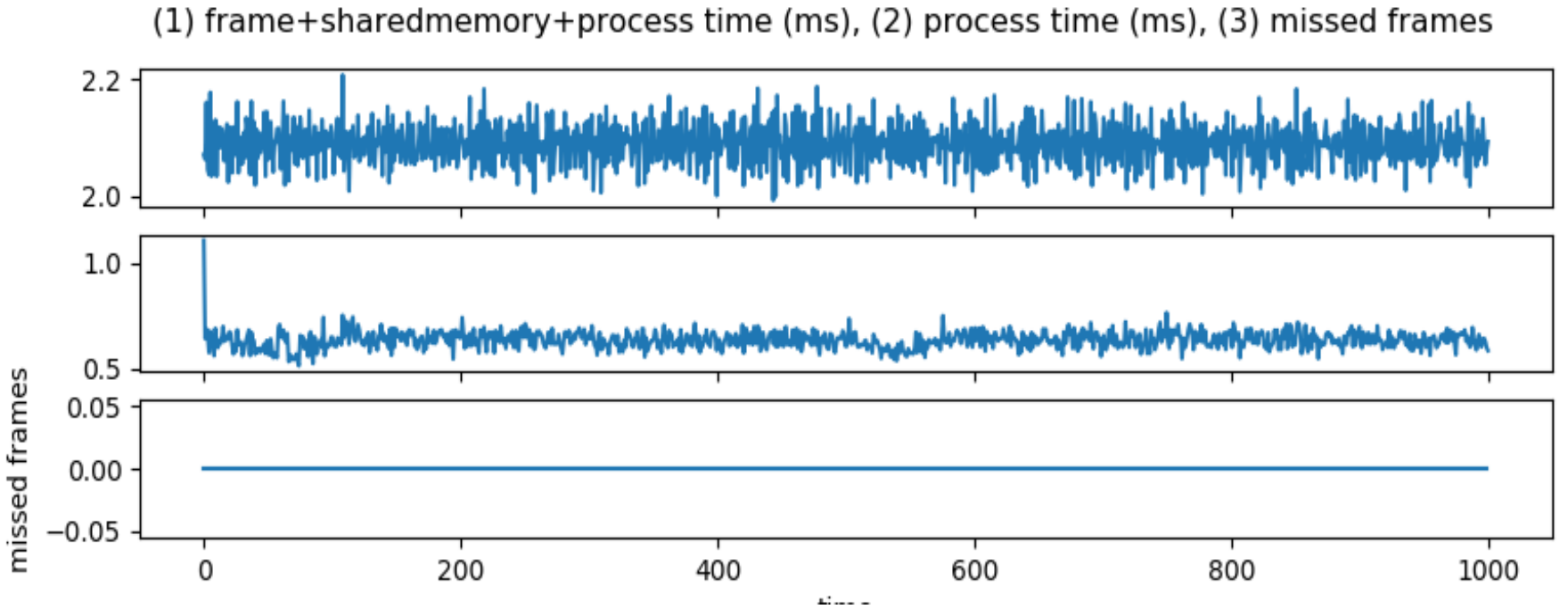
Read frames

GUI

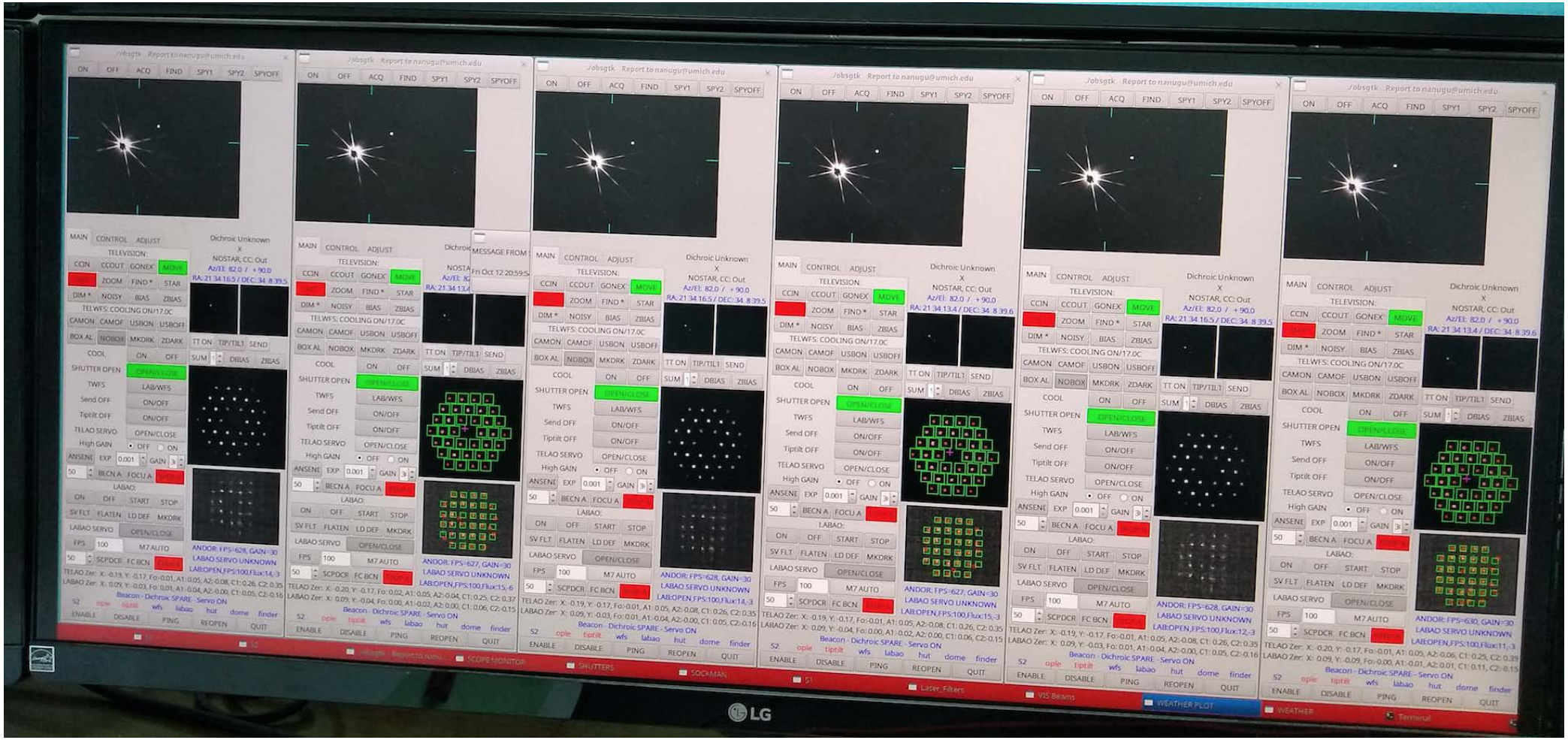


Computational delay in total measured

Type	Delay (ms)
Integration time + camera link + shared memory	2.2
Processing time	0.7



NEW GUIs




ALPAO
(2 guitares)
PAILLASSE
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ALPAO
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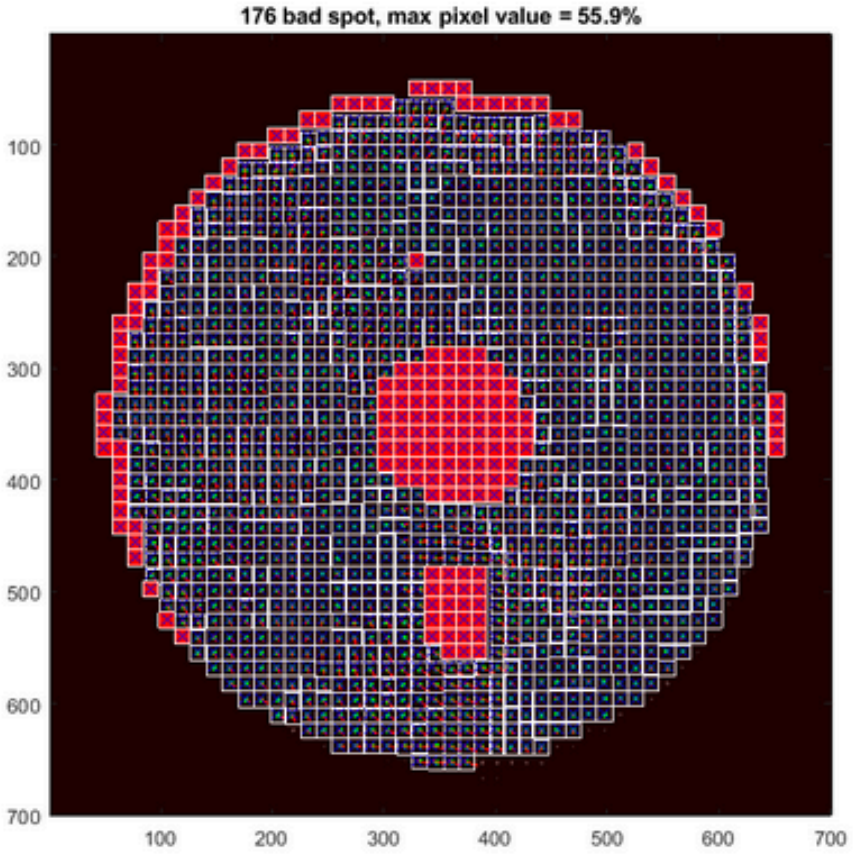
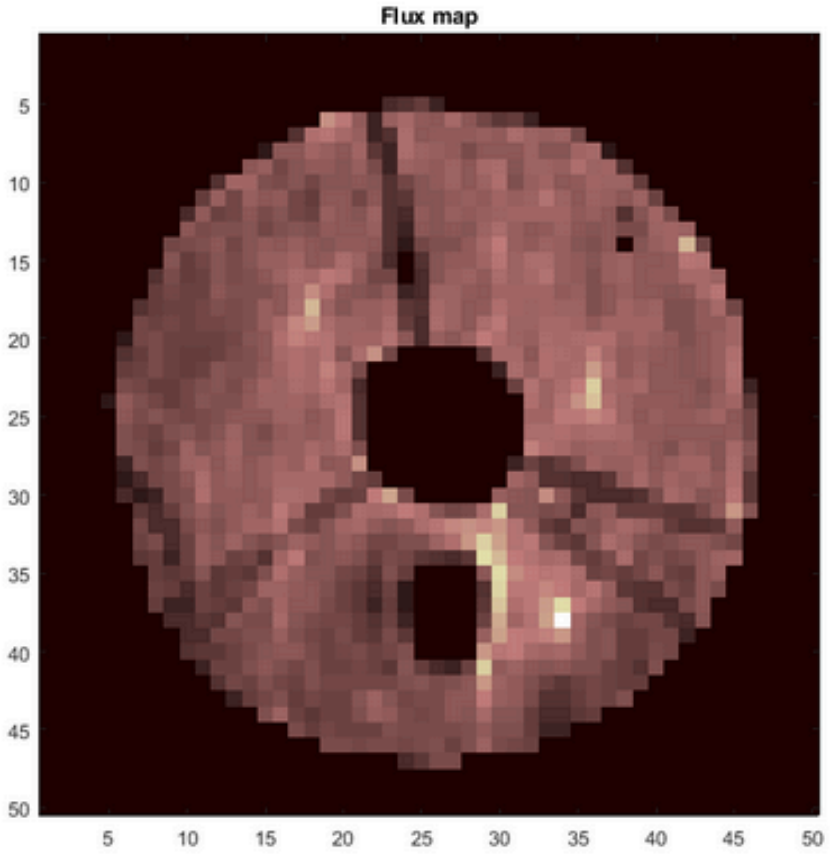
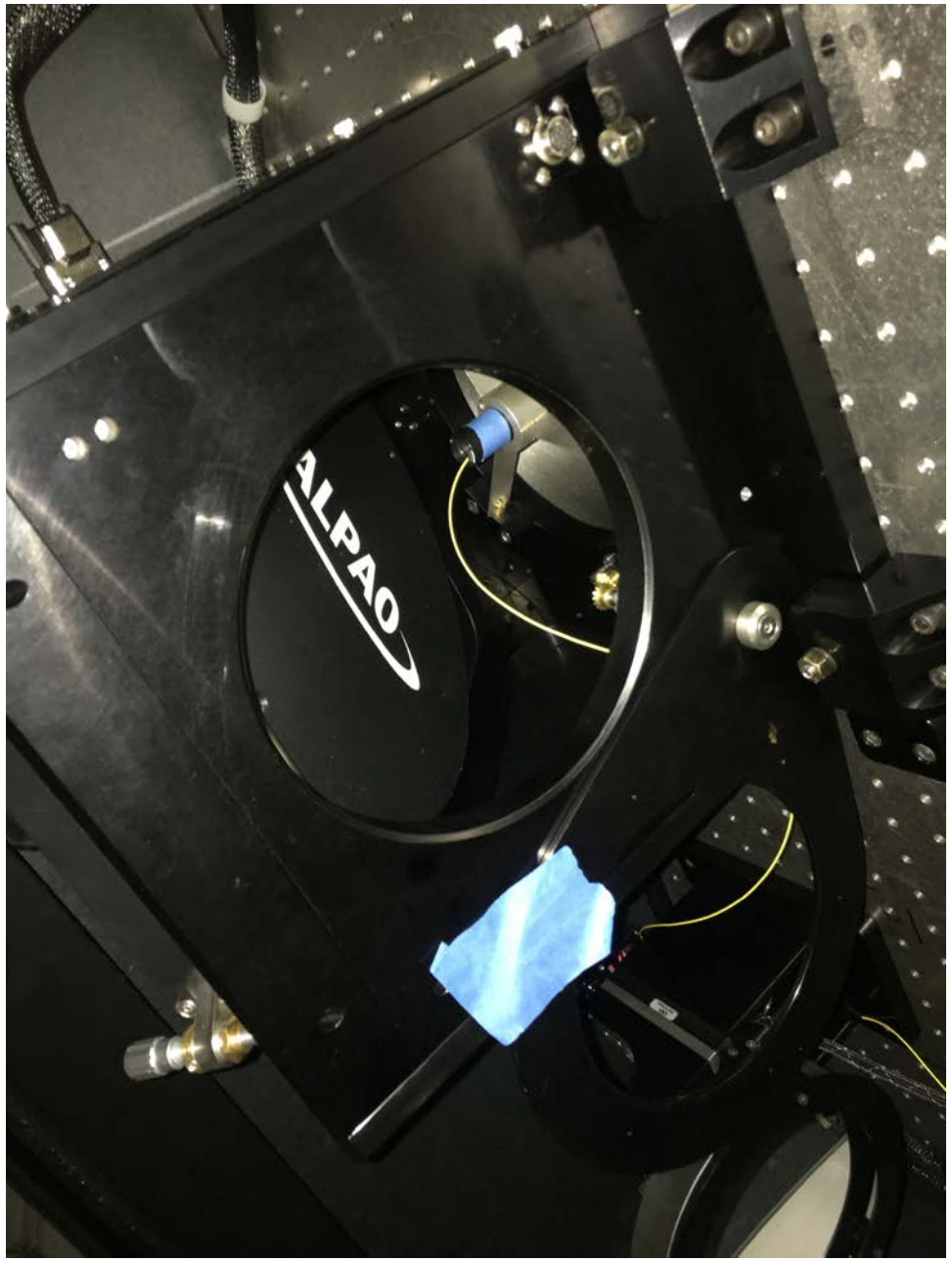
SO 251-2
SO 251-3
SO 251-3
SO 251-4
SO 251-4
SO 251-5
SO 251-6

One bad actuator spoils the whole mirror…..






ALPAO

Current Status

- All optical the components are now in hand, although we need to send two DM's back. One for an upgrade and one to replace a bad actuator.
- The first DM suffered from large temperature instabilities and edge effects.
- The "improved" version of the DMs arrived during the holiday break and we are testing them on the sky. We will return the first DM for the upgrade. These remain the biggest (and only) major risk.
- We have much more to learn about tuning the servo, the interplay between the two AO systems, and simplification of the operational aspects.
- Can now achieve a decent flat with our own equipment. These appear to be temperature dependent.
- First AO fringes tonight???? Stay tuned, it's just starting to get really exciting!

New ATI/NSF Proposal: A Leap in Sensitivity for CHARA/CLASSIC Optical Interferometry

The most significant challenge in ground based interferometry is sensitivity, and so we propose to increase the faint limit of the CHARA Array's CLASSIC/CLIMB beam combiner by 2 magnitudes in the near infrared. This will be achieved by replacing the 20-year-old PICNIC detector with a modern SELEX MOVPE SAPHIRA based detection system. This upgrade will also include spectral resolution in both H and K bands, simultaneous observations in both bands, and a polarization split.

Table 1. Publication/Citation Counts (ADS/NASA)			
Site	**Papers**	**Cites**	**Cites / Paper**
Narrabri II	*10*	*1543*	*154.30*
Mark III	*48*	*2205*	*45.94*
COAST	*41*	*1836*	*44.78*
ISI	*35*	*1475*	*42.14*
PTI	*94*	*3793*	*40.35*
CHARA	**174**	**6435**	**36.98**
IOTA	*100*	*3384*	*33.84*
I2T	*21*	*708*	*33.71*
GI2T	*29*	*854*	*29.45*
Keck	*62*	*1788*	*28.84*
NPOI	**64**	**1828**	**28.56**
VLTI	**536**	**14136**	**26.37**
SUSI	*44*	*845*	*19.20*
IRMA	*7*	*106*	*15.14*
LBTI	**12**	**135**	**11.25**

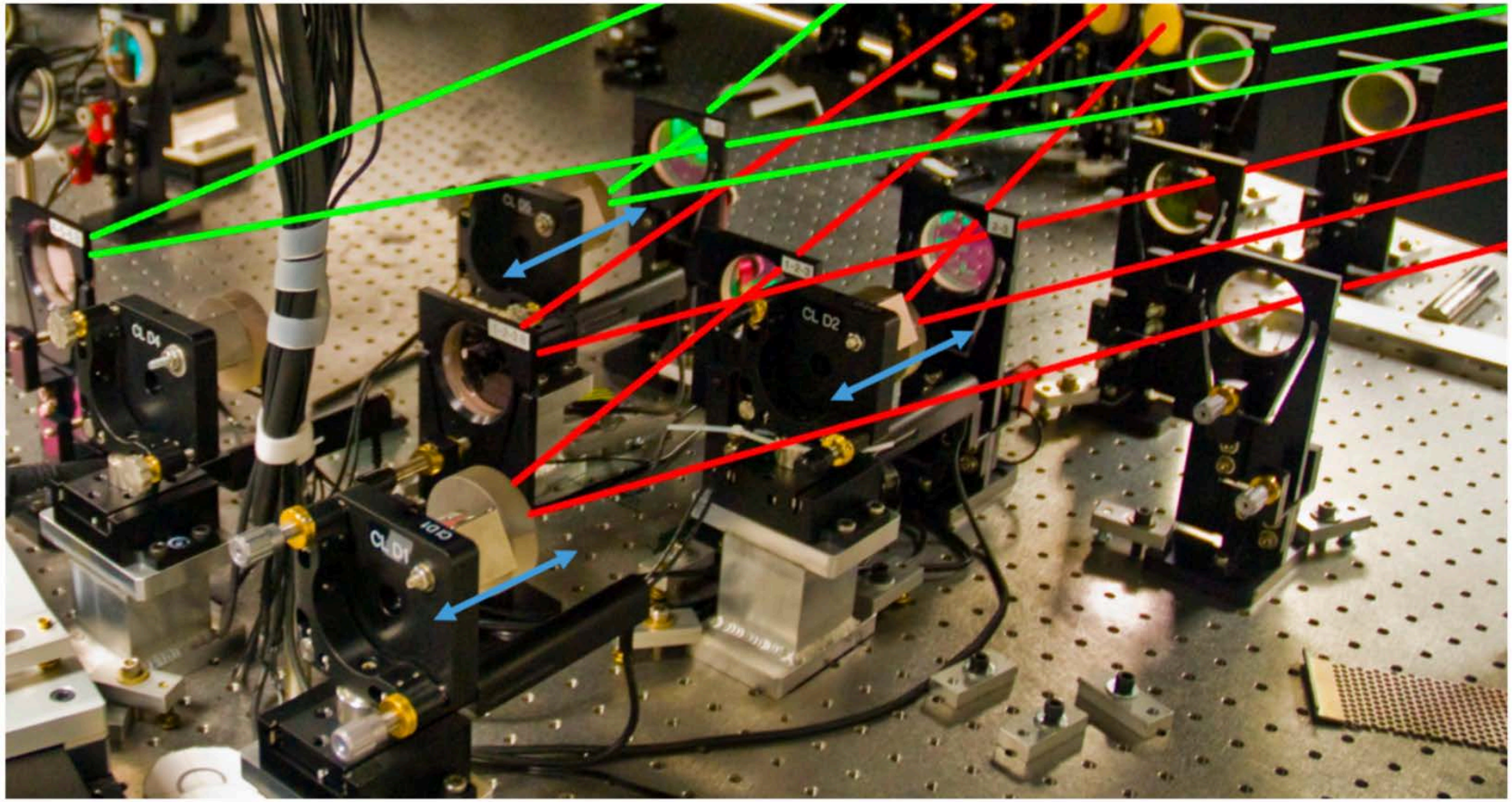
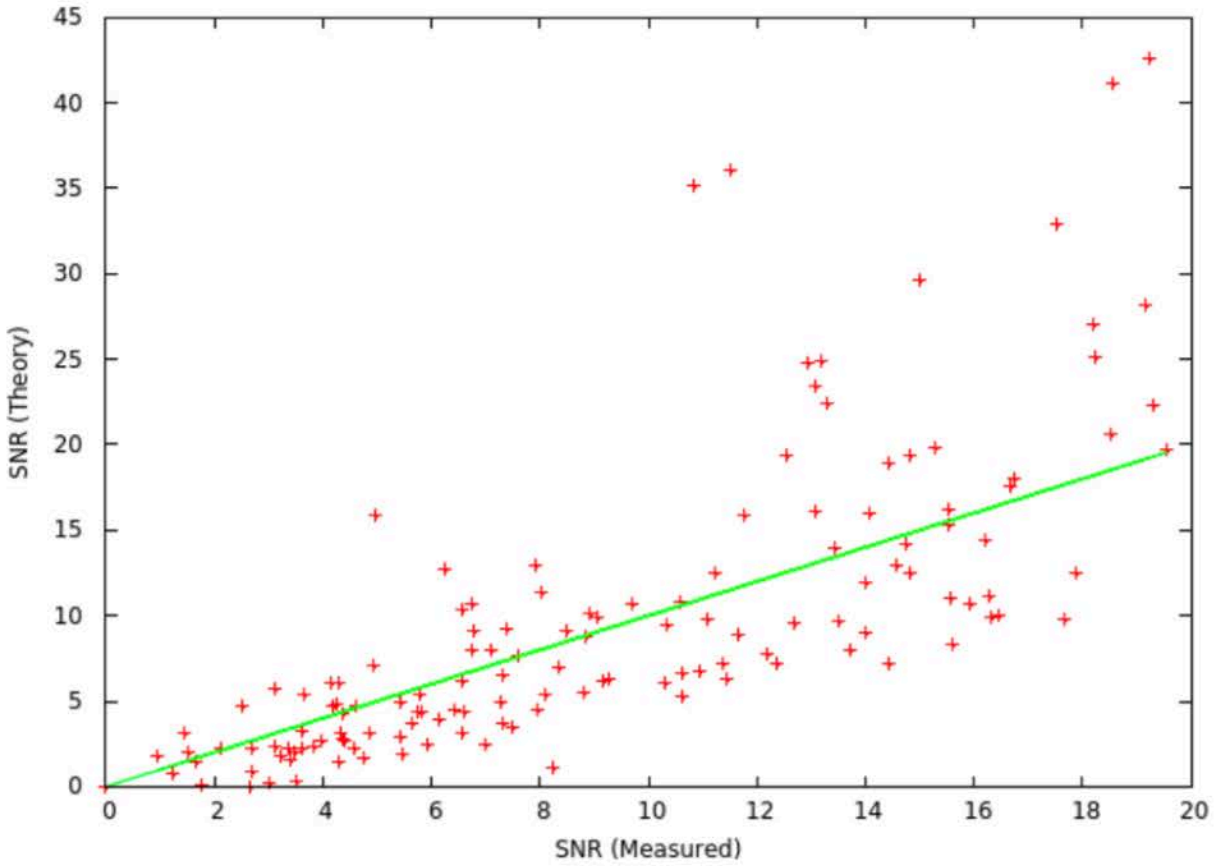


Figure 4. The CLASSIC (Top) and CLIMB (Bottom) beam combiners. The beam locations are drawn in green and red, respectively. The "dither mirrors" modulate the path-length of one beam by up to 150 μm as indicated by the blue directional arrows. The two beam CLASSIC can be reconfigured to form a second three-way CLIMB combiner.



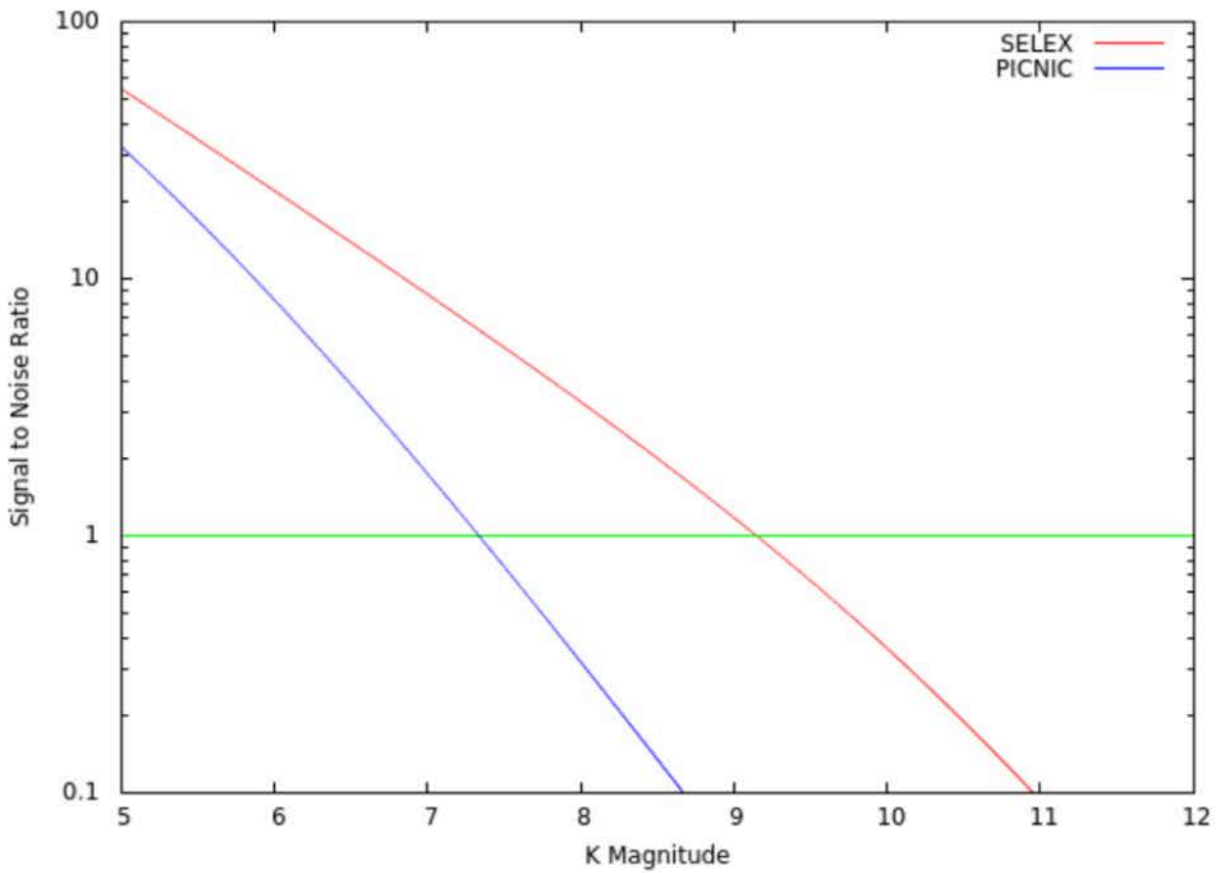


Figure 5. *Left:* Model versus measured SNR of V^2 measurements along with a line showing a 1:1 ratio (green). *Right:* Modeled SNR for H Band in good seeing conditions for the PICNIC and SELEX Cameras. A SNR of 1.0 or greater means that fringes are visible in single scans and the data can be easily calibrated and used for science.

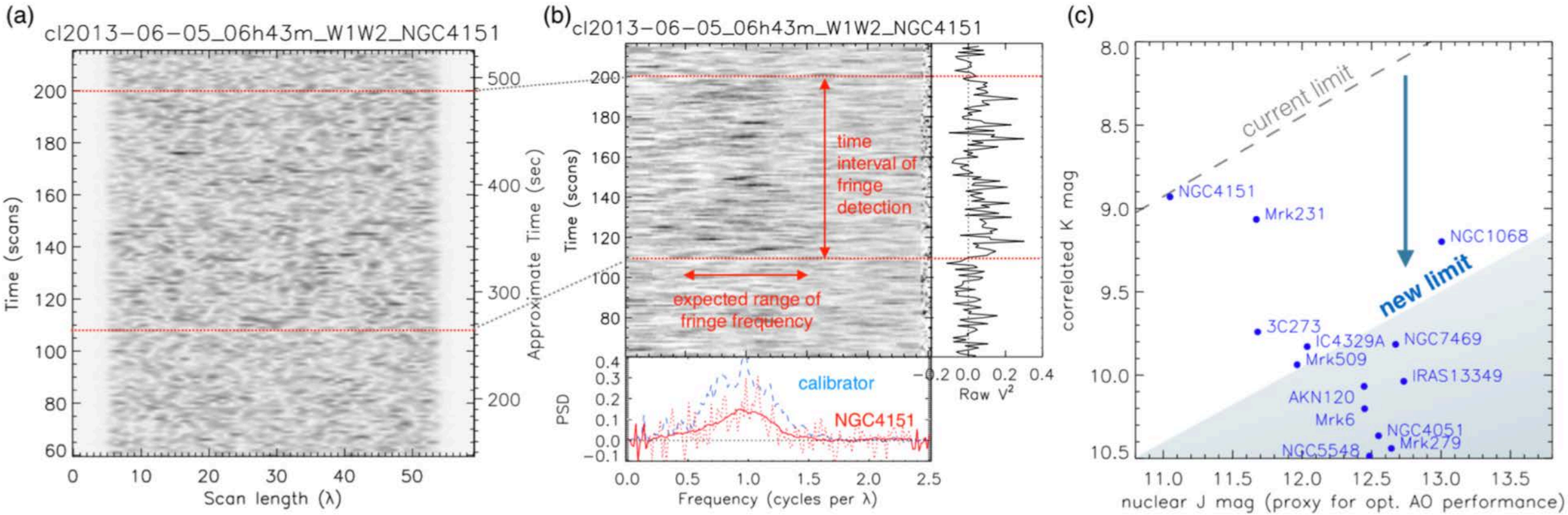


Figure 7. (a) Fringe detection on Type 1 AGN NGC4151 in fringe scan space. (b) The same data but in Fourier power spectra. We can increase the fringe SNR by averaging blindly all the power spectra (bottom panel). (c) AGN targets on the plane of correlated K mag versus nuclear J mag. The latter approximately represents the optical AO performance. Inferred current and new limits are indicated.

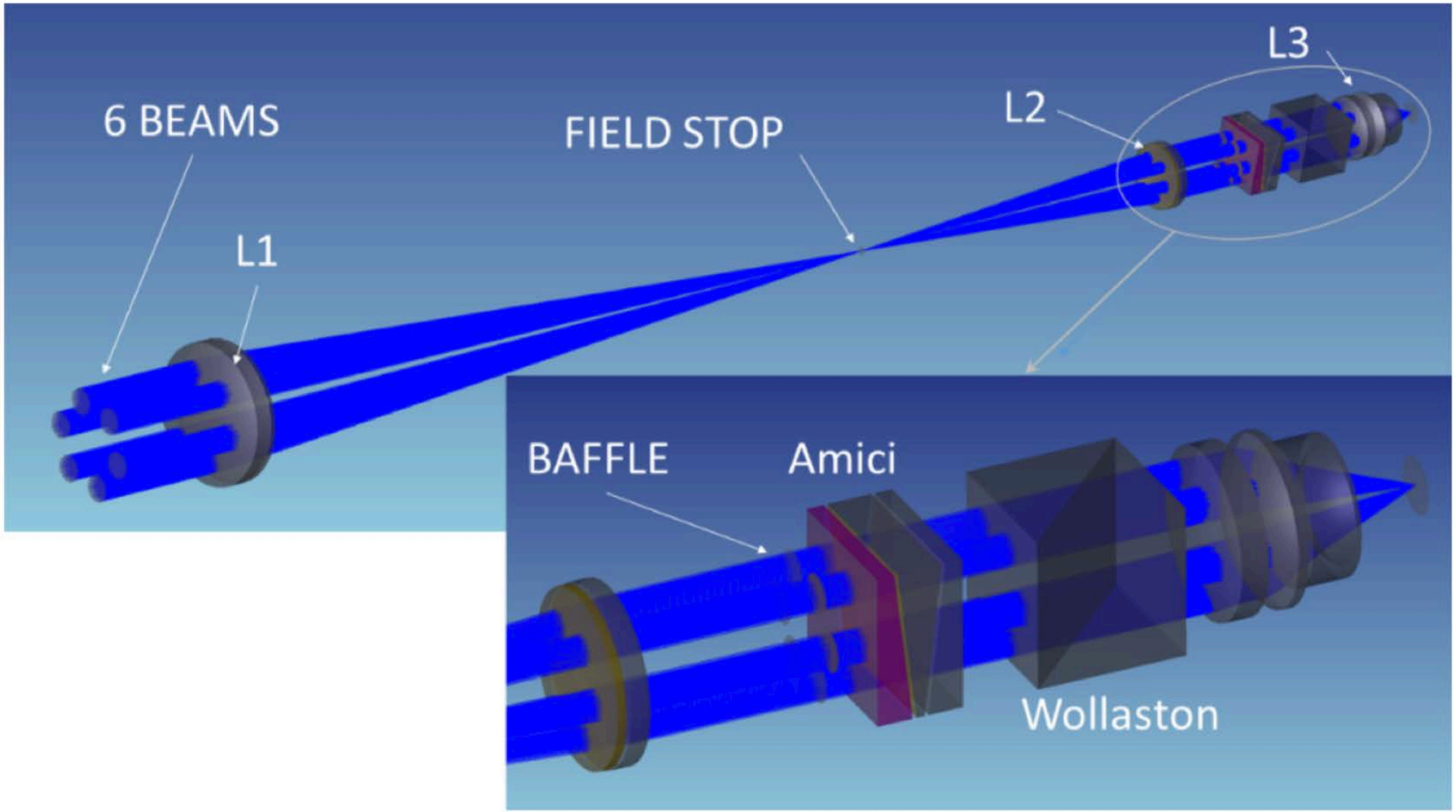


Figure 11. ZEMAX model of the optical design. L1 is part of the existing system, while the remaining cold optics are part of this proposal.

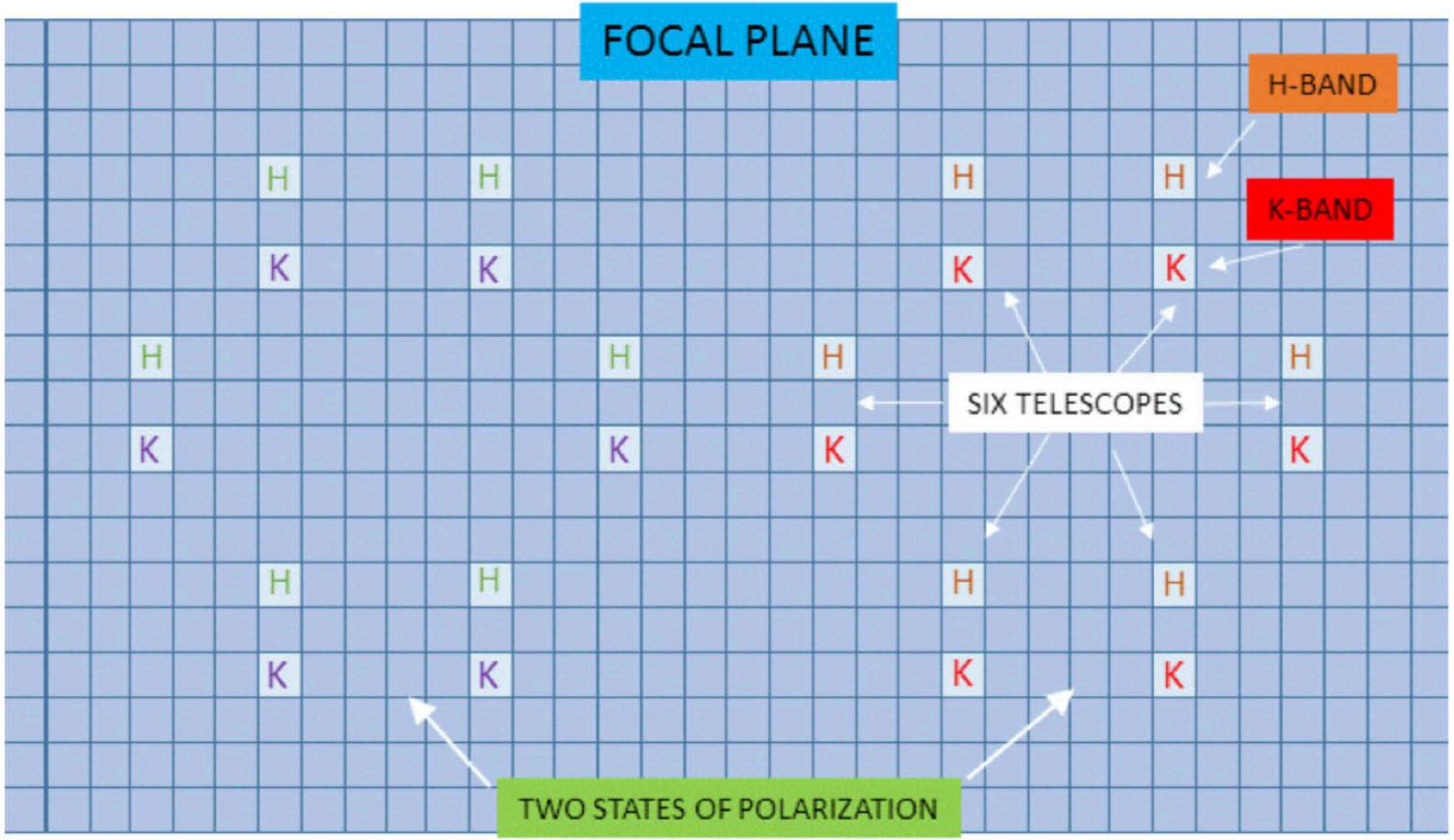


Figure 12. The six outputs are arranged in a hexagon, and the dispersive and Wollaston prisms for two output arrays with separated H and K bands.