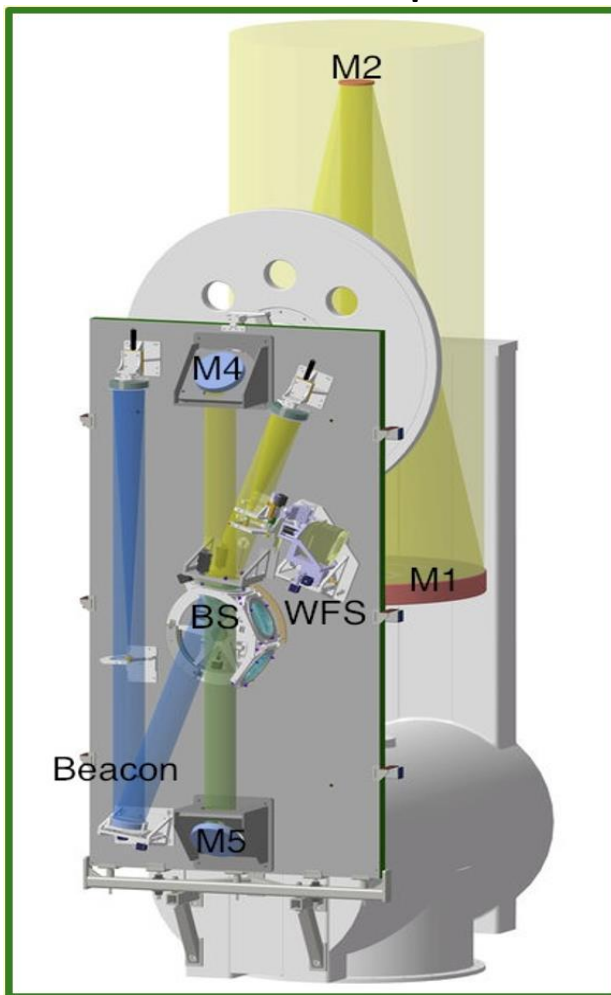# CHARA AO systems

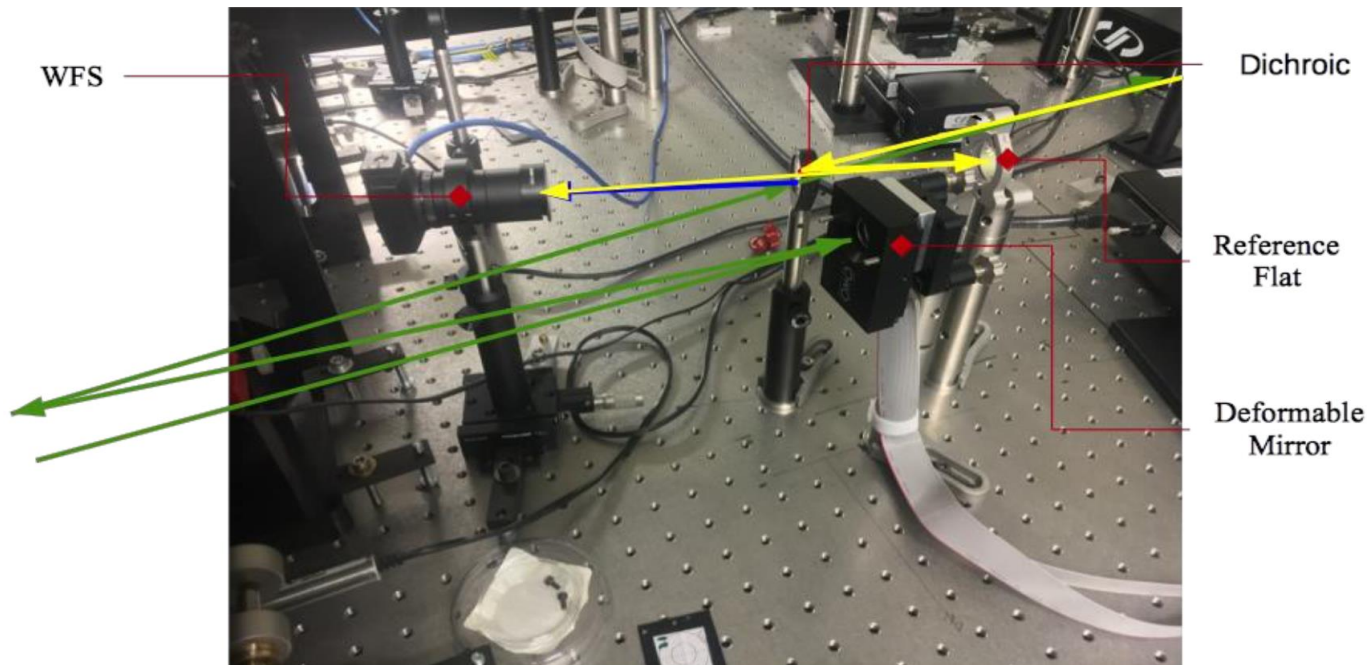Karolina Kubiak & Edgar Rob Ligon

Overview

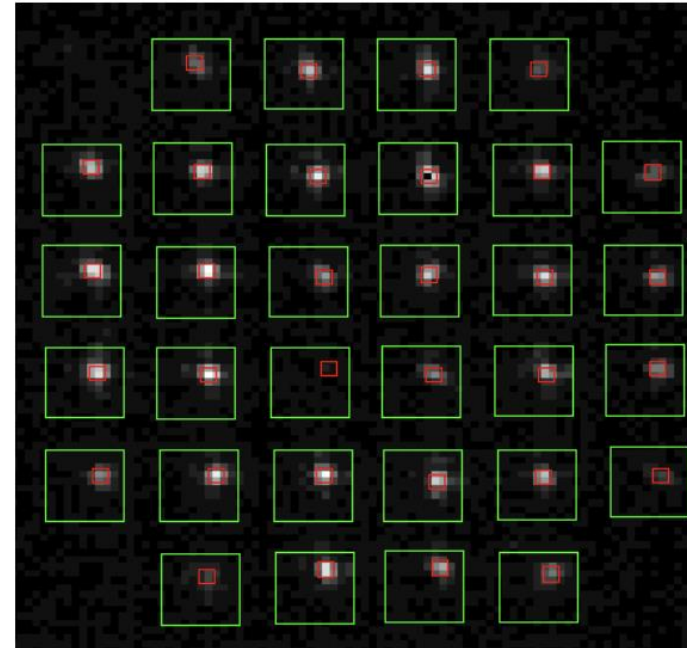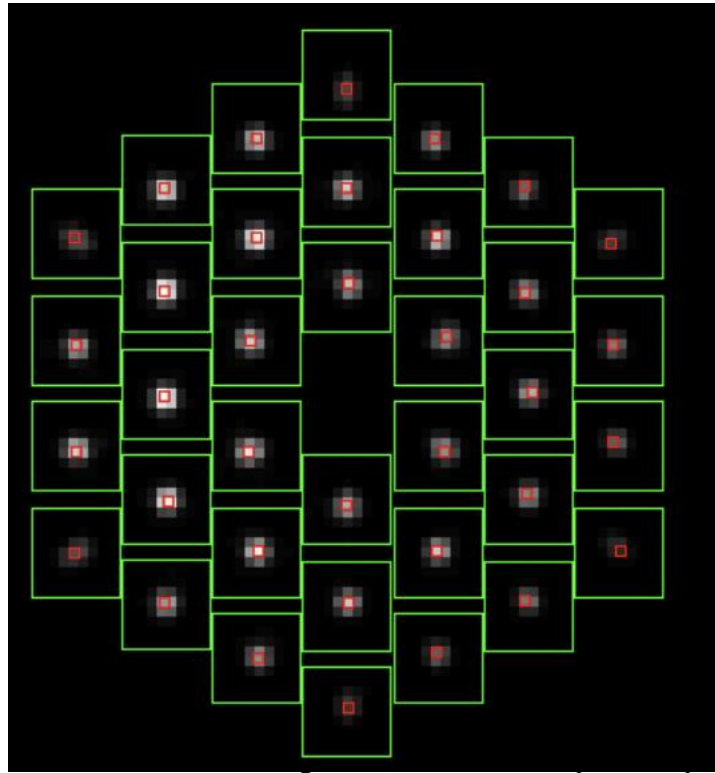Telescope

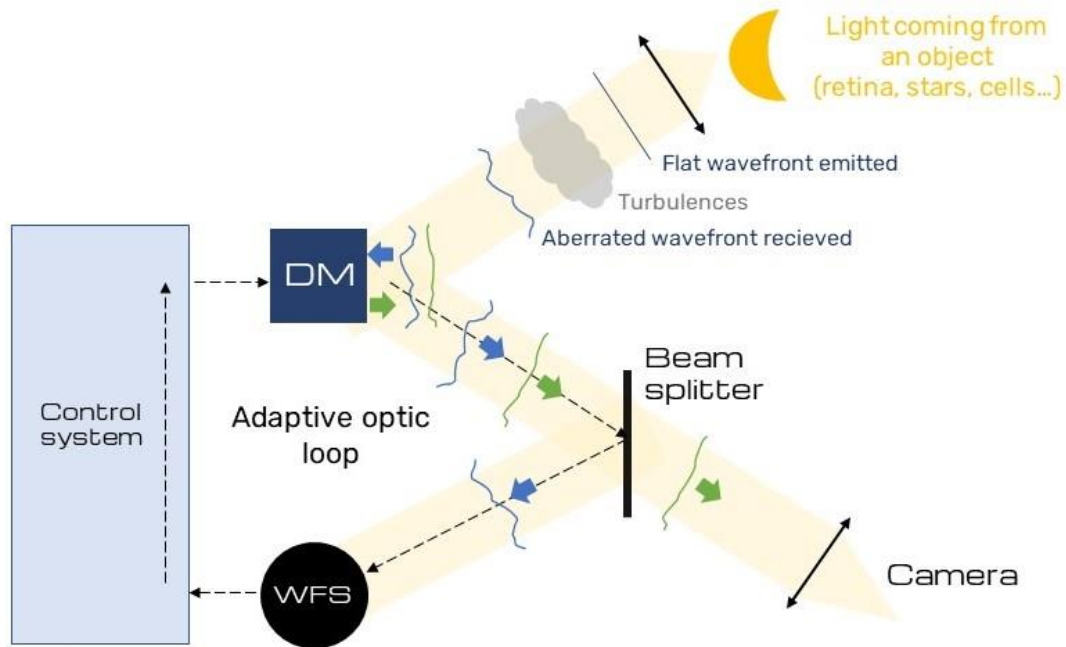fast WFS, locks on star

Optical Lab

Slow WFS, locks on blue beacon

Parameter	Tel-AO	Lab-AO
DM actuators	ALPAO 60	OKO MMDM 37
Size	18 cm	15 mm
Dynamic range	16 μm	9 μm
Inter-actuator stroke	4 μm	0.5 μm
Frame Rate	500 Hz	100 Hz
Mirror best flat	< 30 nm	400 nm
WFS Camera	Andor 897 EMCCD	USB CCD
Lenslet	7x7	6x6

Adaptive Optics Calibration

Light coming from an object (retina, stars, cells...)

Flat wavefront emitted

Turbulences

Aberrated wavefront recieved

DM

Control system

Adaptive optic loop

Beam splitter

Camera

WFS

close-loop adaptive optics

Simple steps:

Even illumination of WFS
          calibration source for TelAO
          blue beacon for LabAO

Centroids positioning
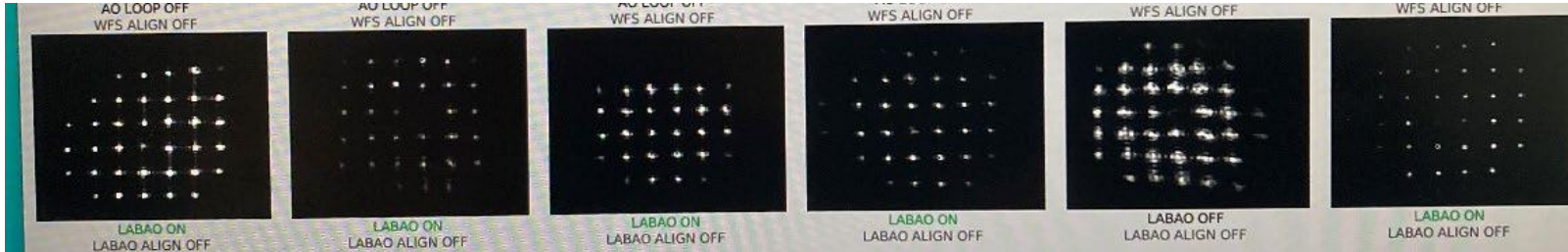   no vignetting

Flattening the DM
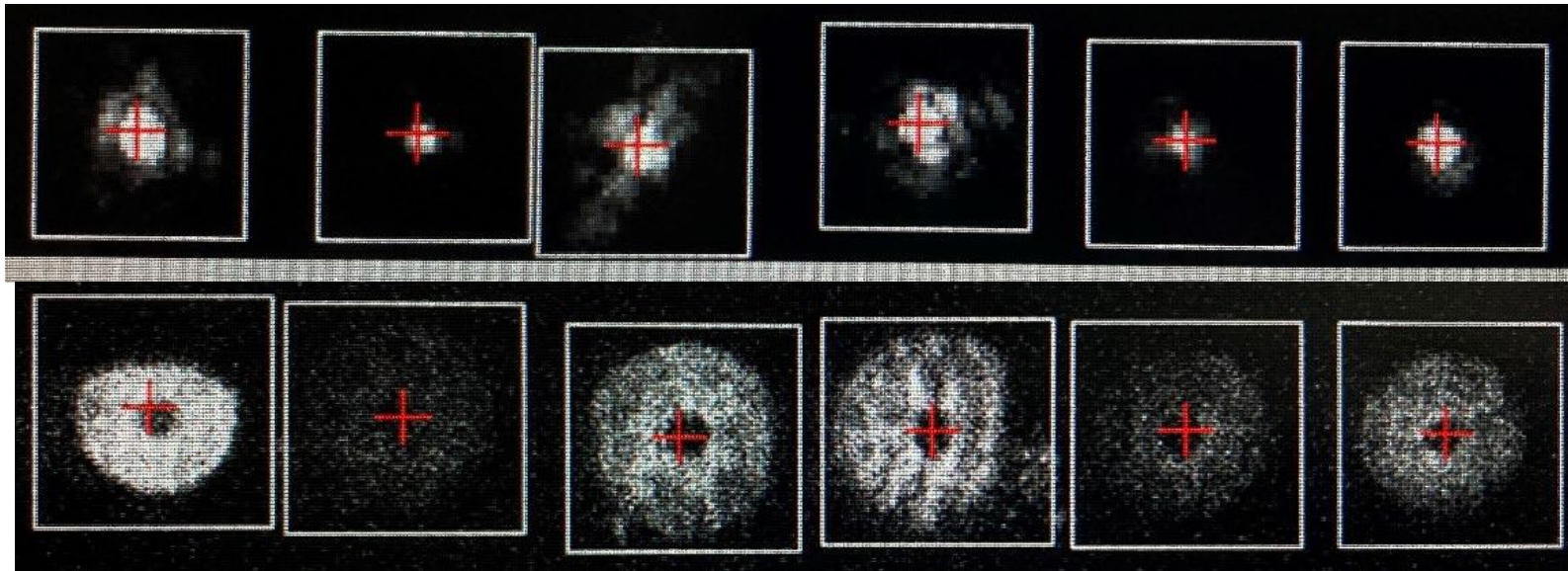   biggest dynamical range of actuators

Measuring recontructor
          fast

Adaptive Optics Calibration

S1S2E1E2W1W2 LabWFS on blue beacon

E1W2W1S2S1E2 red beacons seen on SPICA, and the corresponding pupil illumination.

AO

Adaptive Optics Calibration

On sky reconstructors !

Work in progress...

- sky flats
- the same reconstructor for science and calibrator
- "single button" for operators
- first test done in February

W2 deformable mirror
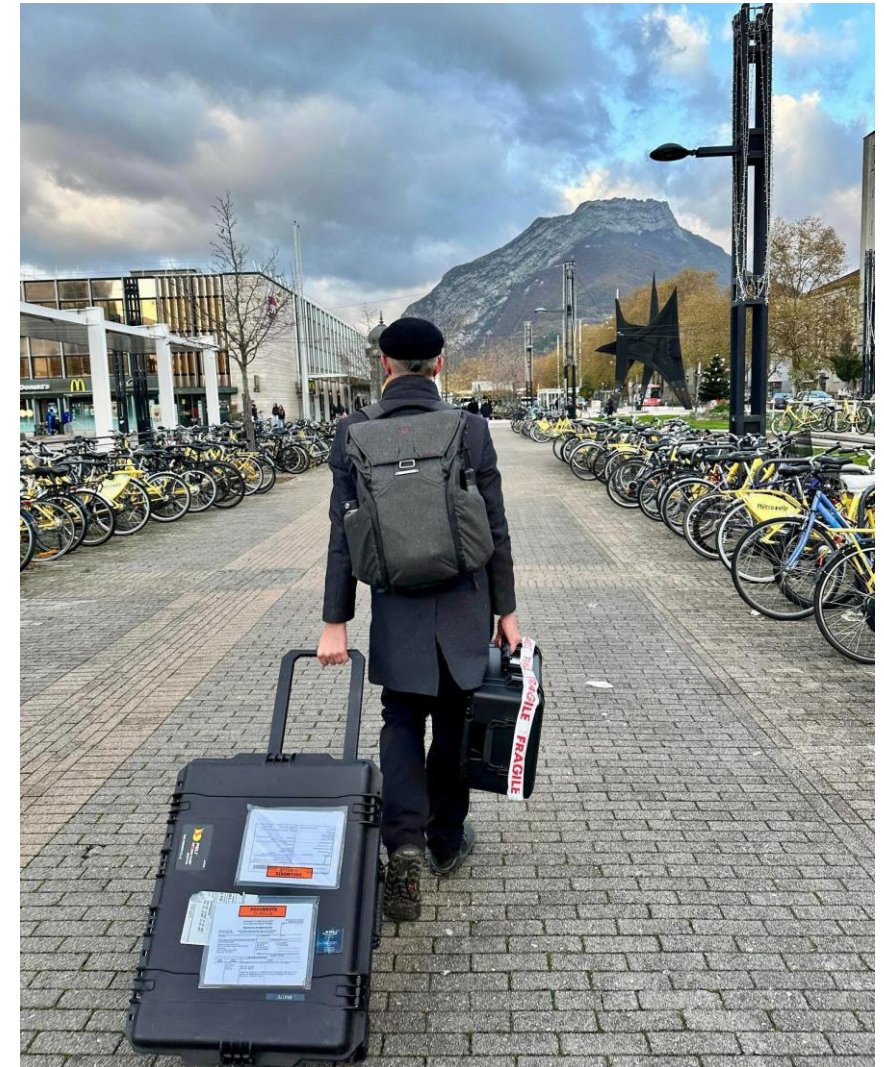
Actuator problems

DM sent back to **ALPAO** summer 2023
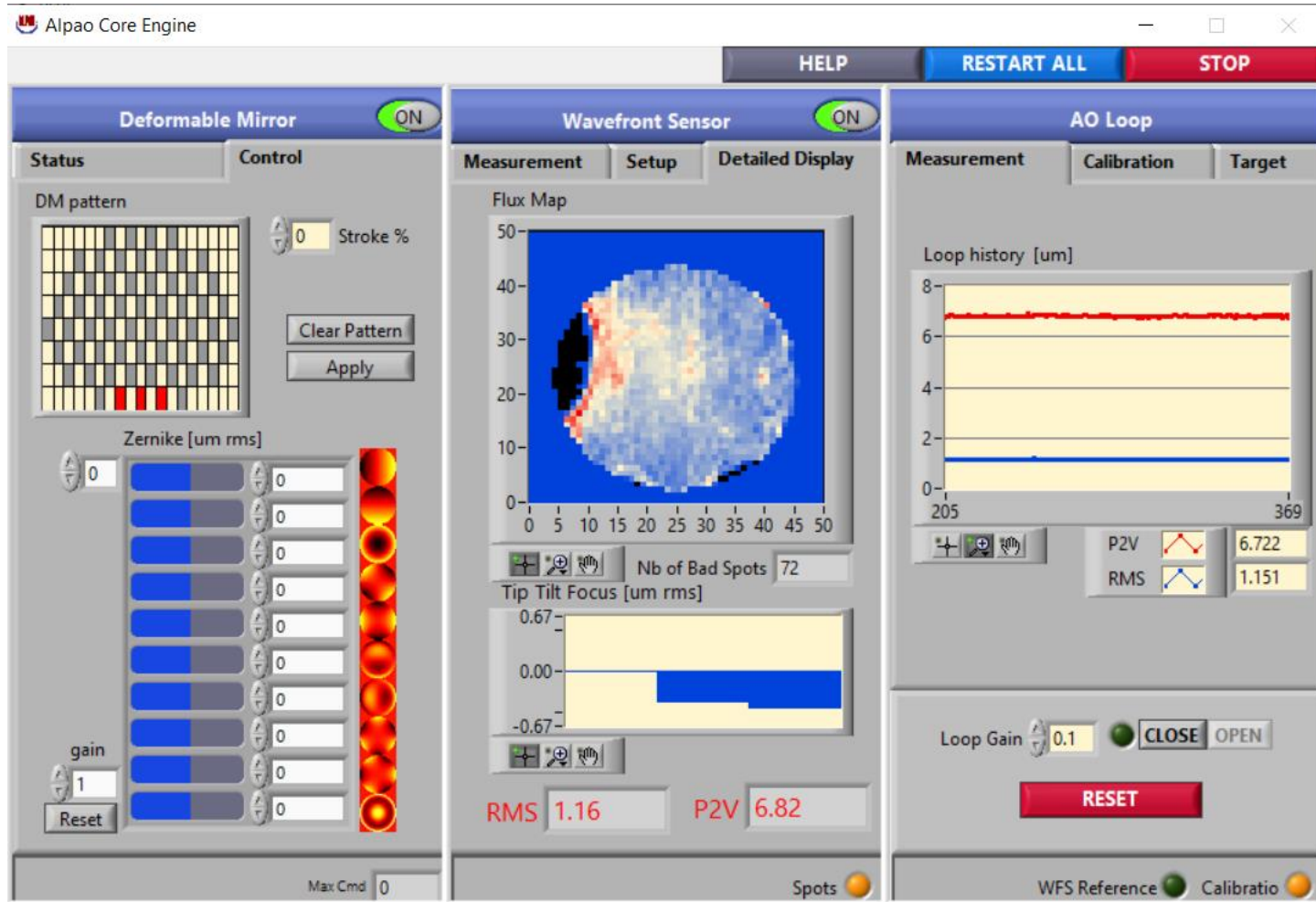
25 November 2023
Facebook announcement
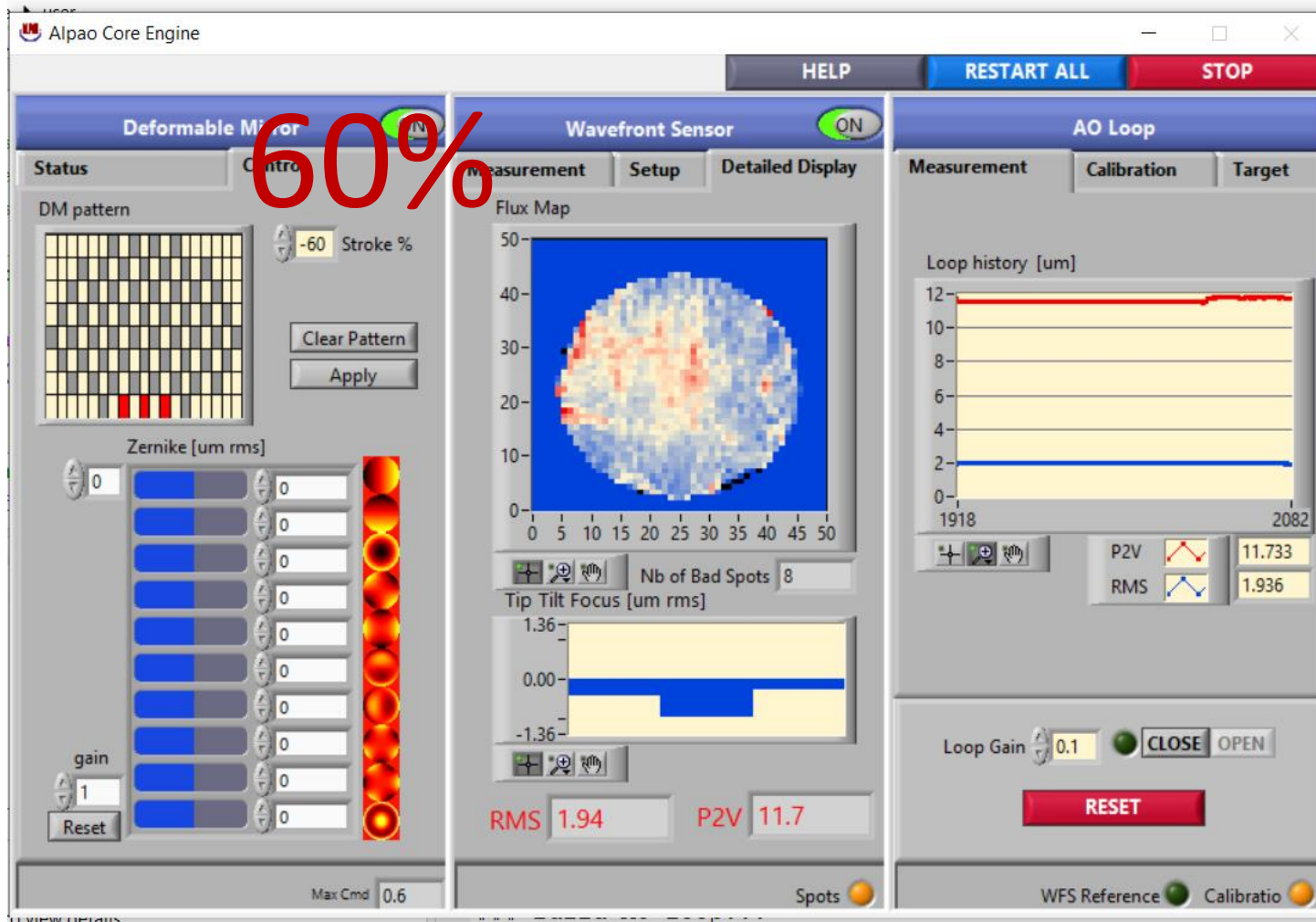
Installation planned
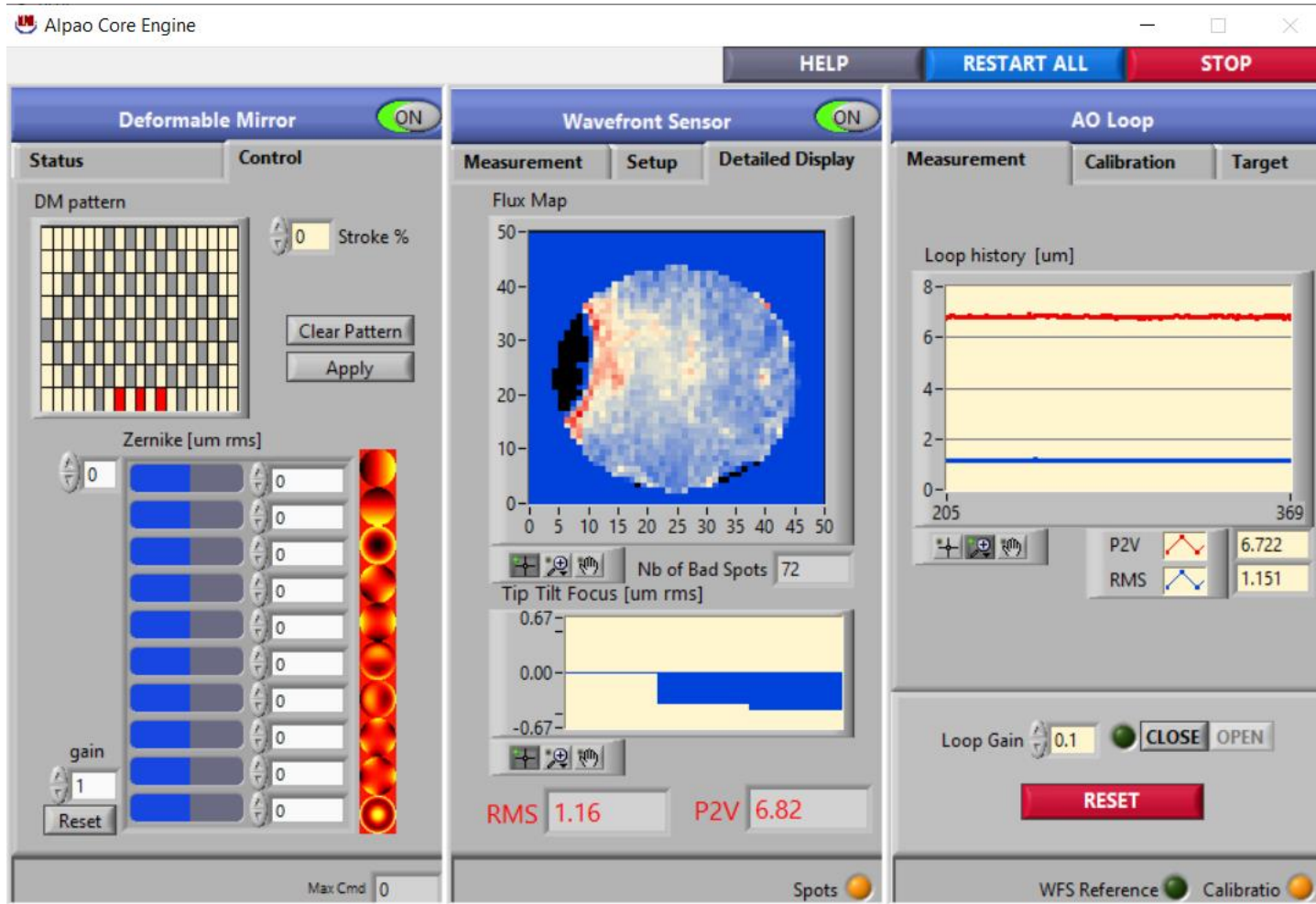5 December 2023

But...

W2 deformable mirror

W2 deformable mirror

W2 deformable mirror

"we have recently identified a weakness in recently produced actuators, the glue has a hard time bonding with a new type of magnets. "

February 14, 2014

Commercial break!

New CHARA AO software !

Theo ten Brummelaar

phase image

image calculated from the
measured phase
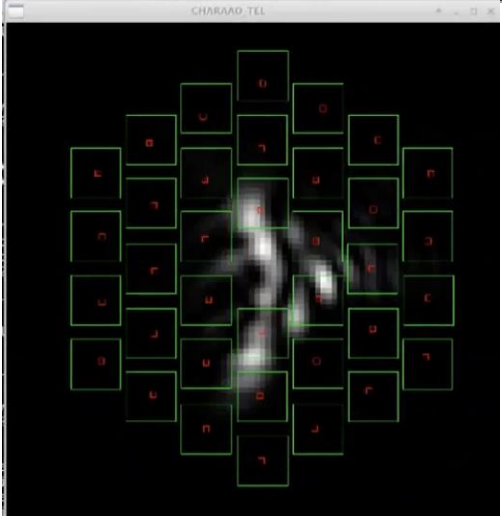
AO

Take home:
1. LabAO upgrade proposal
2. W2 DM actuators need to be replaced (again)
3. On sky reconstructors
4. W1 LabAO rebuilt (Feb 2024 by Robert Ligon)
5. New software (by Theo ten Brummelaar)
6. Monitoring AO systems (SPICA)