SOLARNET

Integrating High Resolution Solar Physics

Report on
Modular WFS: hardware implementation and integration of the WFS prototype

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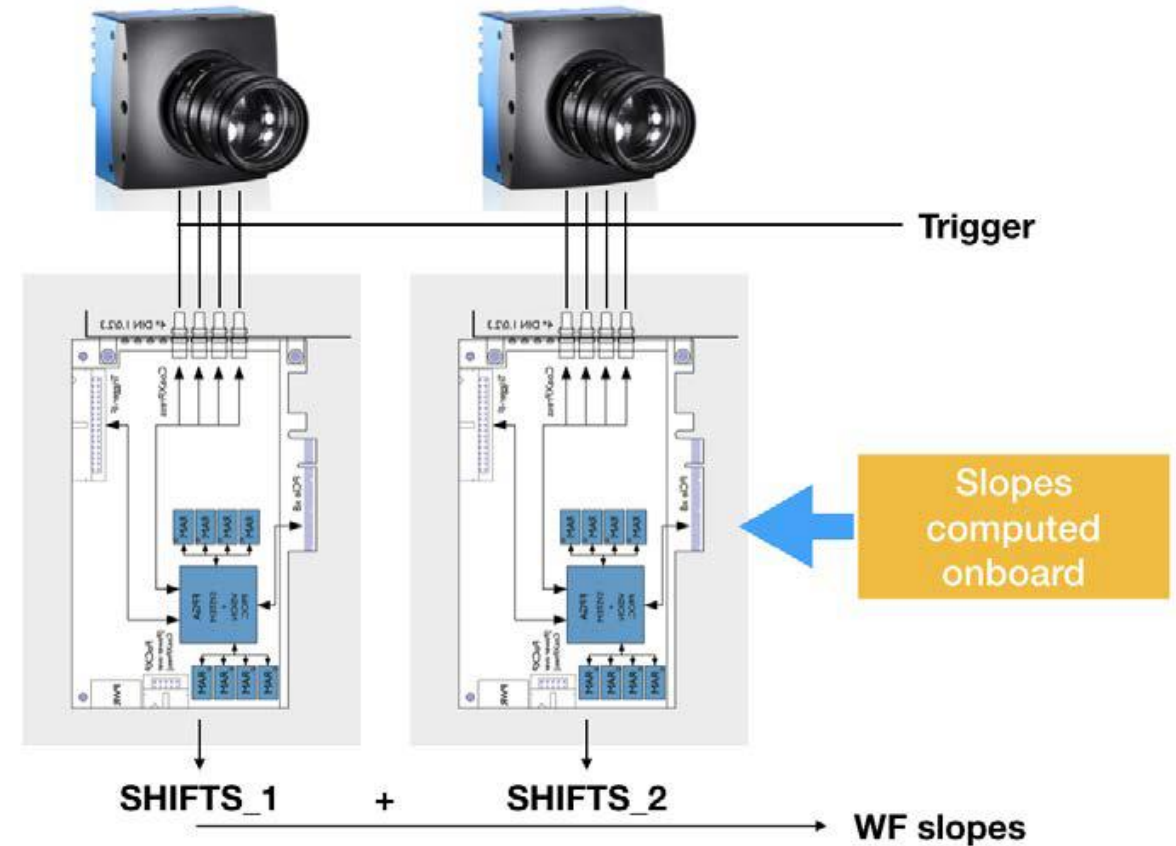
Introduction

- EST will be equipped with a state-of-the-art Multi-Conjugate Adaptive Optics (MCAO) system that will own 5 deformable mirrors (DMs) and 2 Shack-Hartmann wavefront sensors (SH-WFSs)

- Pupil size and its fine sampling is predicted to be larger than any existing fast detector

- Multiplexing of the pupil on different detector is the goal of this study

- For this experiment, we planned to use 2 sCMOS 1kx1k, each one imaging one half of the pupil at 1 kHz with microsecond sincronization

- We report about the adopted optical layout, implementation and first optical tests
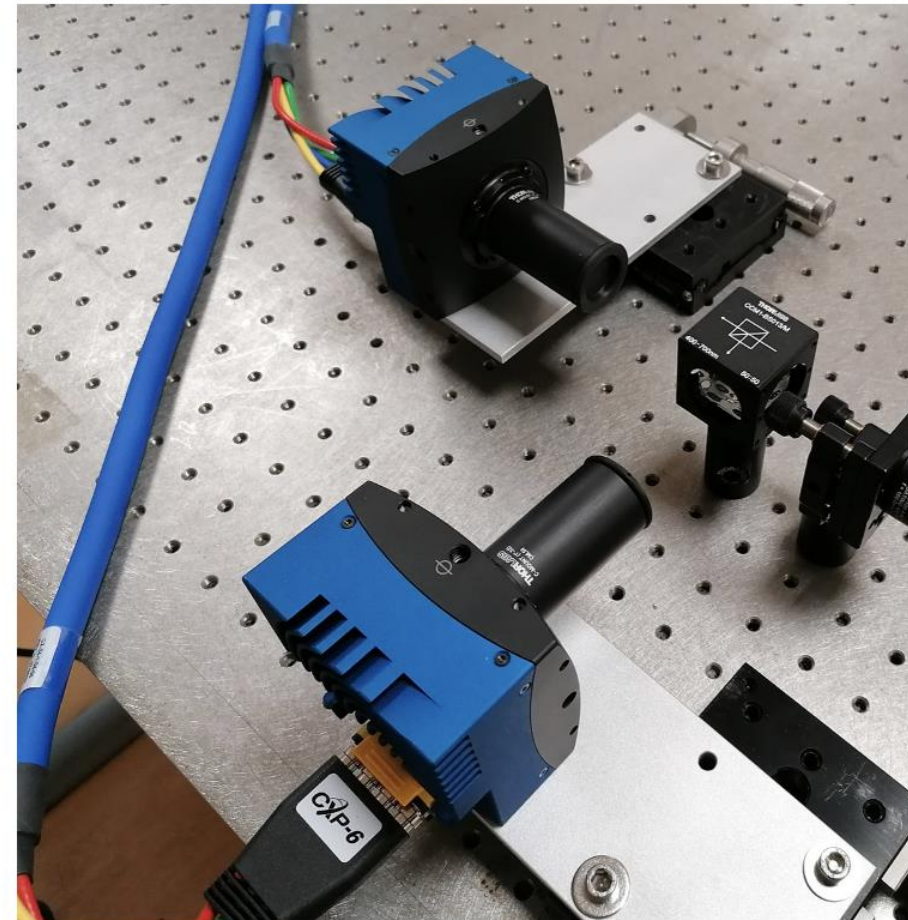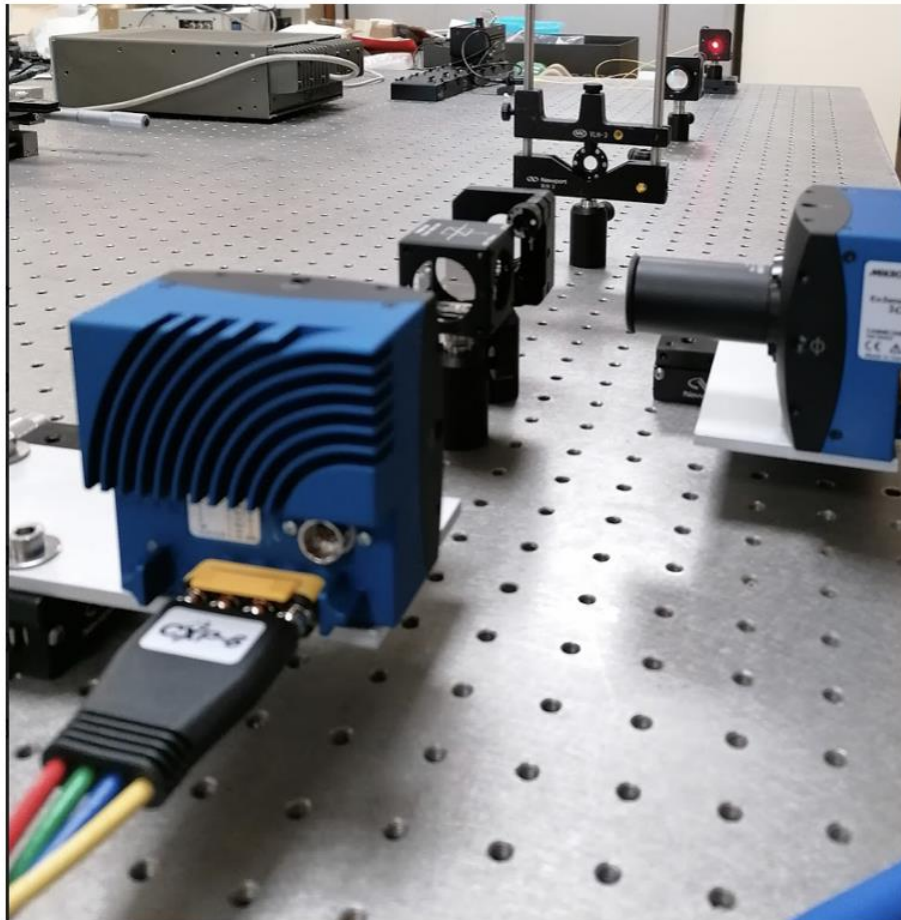
Adopted optical layout
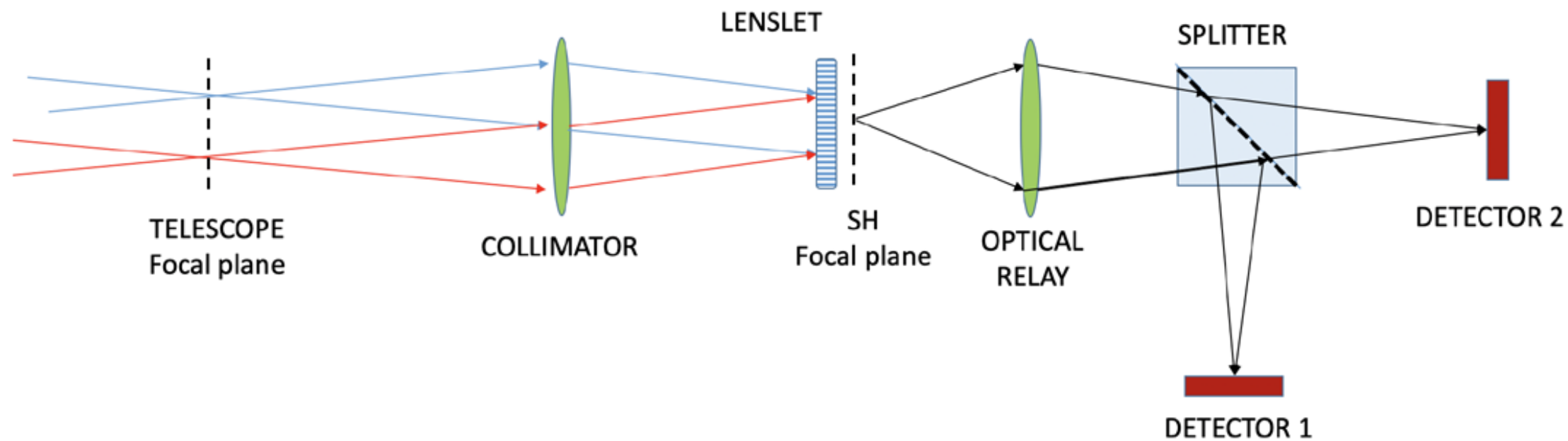
Optical materials

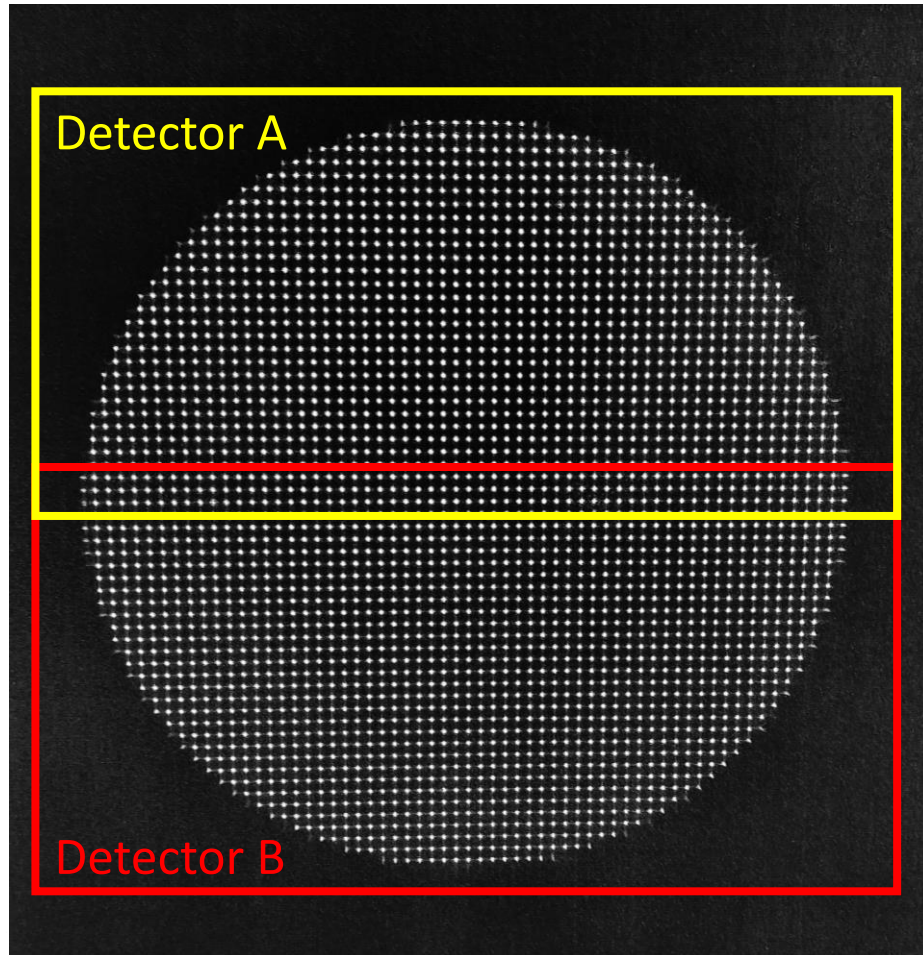- *Source*: Thorlabs LPS-635-FC SM fiber laser

- *Collimator*: Thorlabs AC254-500-A-ML, BBAR coating 400-700 nm, f=500mm

- *Lenslet*: Thorlabs MLA150-7AR , lenslet array, 5.2 mm of focal length, 150 μm of pitch, more than 3000 subapertures

- *Reimaging lens*: Thorlabs AC254-100-A-ML, BBAR coating 400-700 nm, f=100 mm

- *Cube beam splitter*: Thorlabs CCM1-BS013/M, coating 400-700 nm, 50:50

- *Detectors*: Two CMOS EoSens 3CXP cameras with dedicated frame grabbers

Trigger

Slopes computed onboard

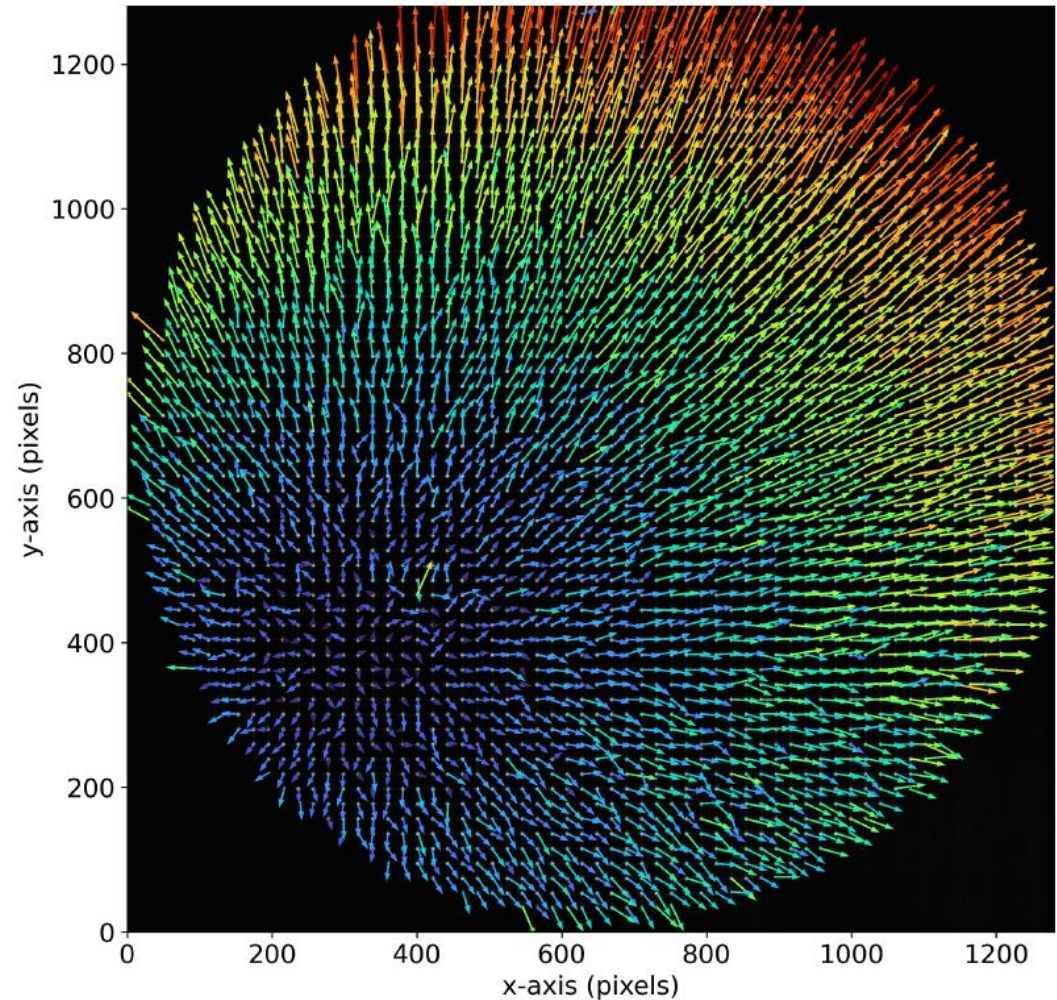SHIFTS_1 + SHIFTS_2 → WF slopes

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 824135.

Hardware implementation and integration

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Preliminary tests

Static test for injected defocus and tilt aberration
(courtesy of M. Stangalini)

Detector A

Detector B

Raw data

Conclusions and future steps

- Detector syncronization

- Shack-Hartmann calibration (Thorlabs WFS20-5C)

- Static test with deformating-lens (DL)

- Tests with rotating phase-screen

- Off-line data processing (IDL and Python)

- Report preparation (D7.16 Modular WFS Report on laboratory tests (T0+36, on-track); D7.17 Final report on system performances (T0+48))

- Additional study on real-time processing with procured FPGA

Thanks for your attention