



MIRCx and MYSTIC: instrumentation work update

John Monnier (U. Michigan)

Stefan Kraus (Exeter)

Narsireddy Anugu (Exeter)

Jean-Baptiste le Bouquin (Grenoble)

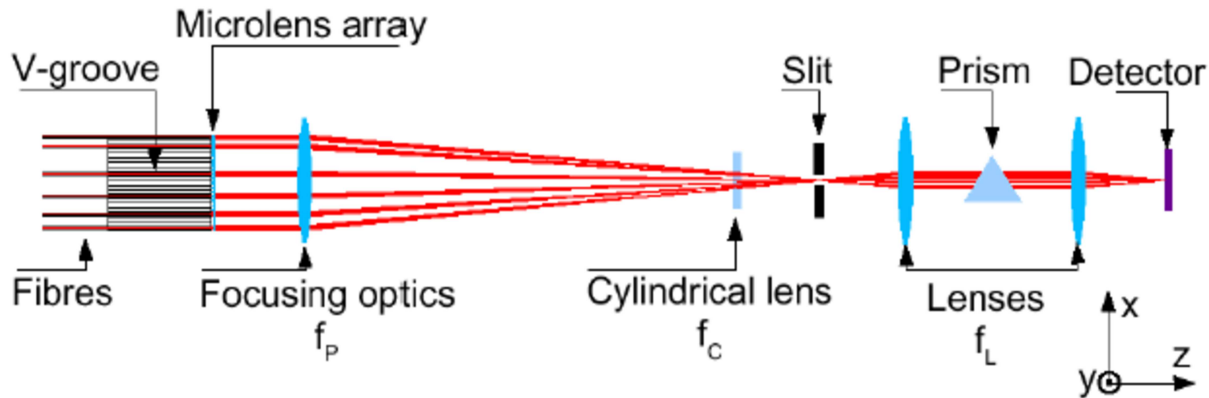
Cyprien Lanthermann (Grenoble)

And in collaboration with FLI colleagues (Grenoble)

MIRCx



MIRCx upgrade program



Motive: for sensitivity and possible fringe tracking capability for MYSTIC.

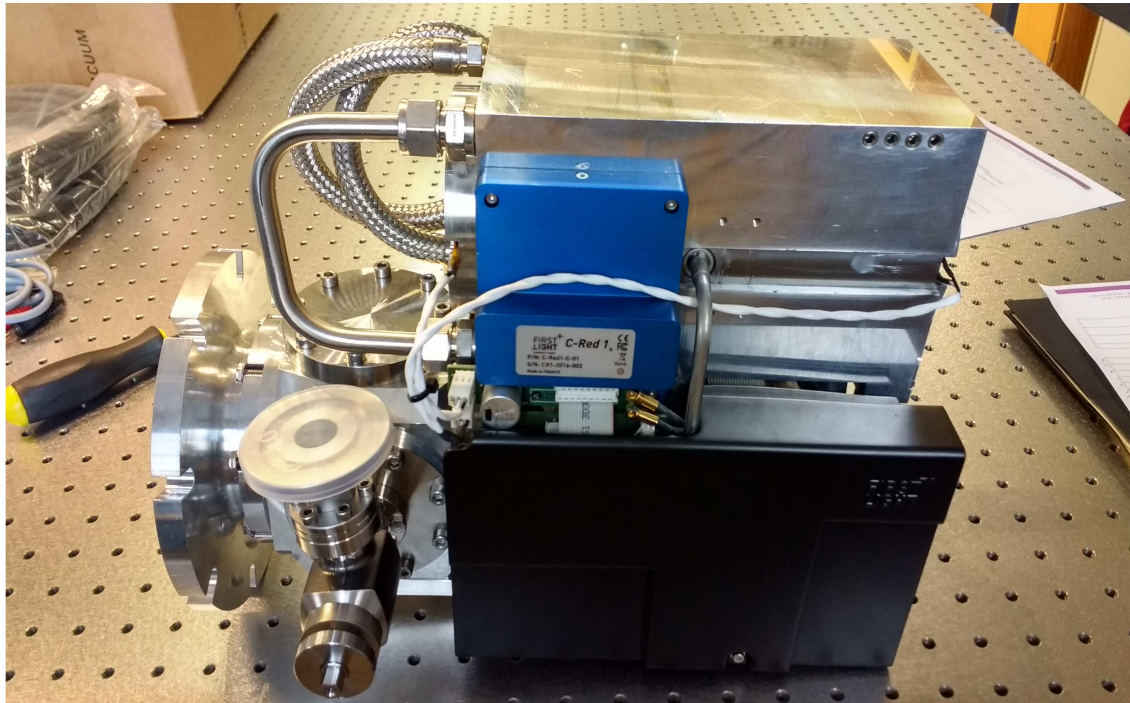
Phase 1 (2017)

- Upgrade with a sub-electron readout noise SAPHIRA detector
- Commissioning of fiber polarization controllers

Phase 2 (2018):

New fibers for J-H band and associated injection optics. Possibly a new v-groove for less cross-coupling. Re-arrangement of optical table.

First Light Imaging camera (SAPHIRA detector)



Goals

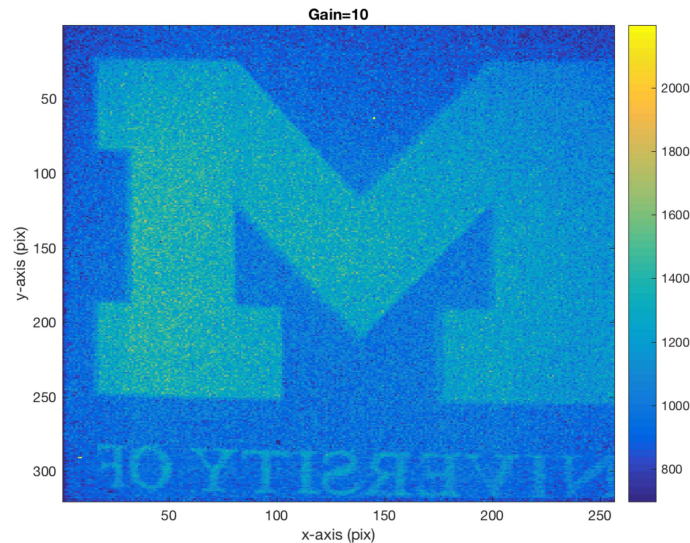
Readout noise	< 1 e-/px
Q. Efficiency (J, H and K)	75%
Background current	< 300 e-/s
Frames/second	3500

Example Michigan camera

Status: camera is ready at FLI and currently analyzing data for acceptance.

Electron Avalanche Photodiodes

SAPHIRA detector uses e-APD technology: Noiseless amplification of electrons inside infrared pixel before they are reading out.





Other updates

- Data acquisition hardware and software
 - Obtained 5 quotations for computer hardware (high clock speed and low latency camera link < 0.3 ms; 3500 frames/s)
 - Installed some of the CHARA softwares on a local machine
- Optical re-design
 - Imaging lens
 - Optics to accommodate new camera pixel scale and J+H bands
- Fiber testing
- Working on polarization controller motors (wiring and control software)



MIRCx timeline (again)

Phase 1 (2017)

- Upgrade of a low-read noise SAPHIRA detector camera to increase sensitivity
- Commissioning of polarization controllers
- Will be May and July (most probably)

Phase 2 (2018)

- New fibers for J-H band and associated injection optics. A new v-groove for less cross-coupling. Re-arrangement of optical table.

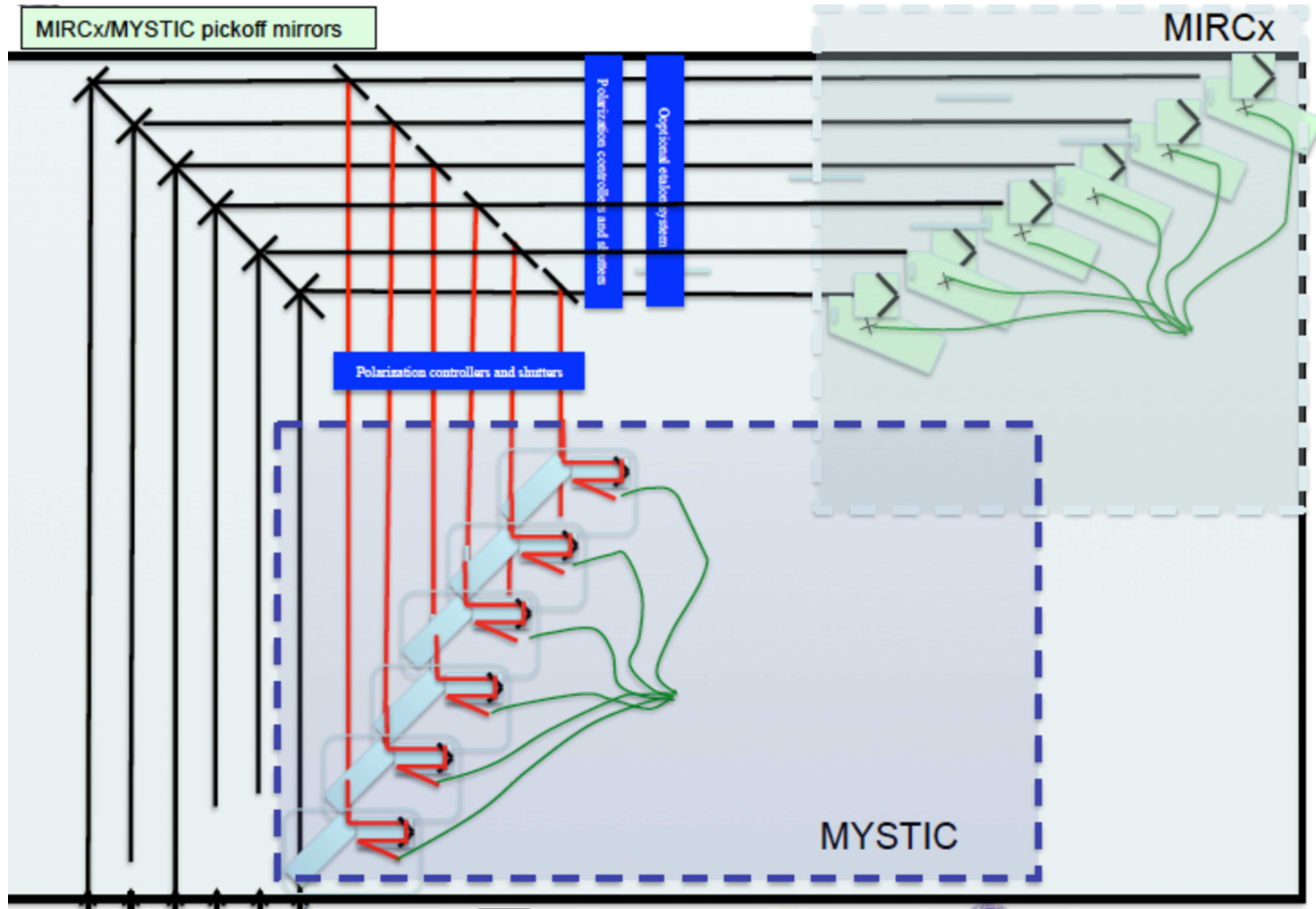


MYSTIC update

Michigan Young STar Imager at CHARA:

- A cryogenic 6-beam K-band combiner for CHARA with SAPHIRA detector, all fiber system.
- New features: polarization mode, fringe tracking integrated with MIRC_x.
- Optional 4-beam mode using spare GRAVITY integrated optics combiner

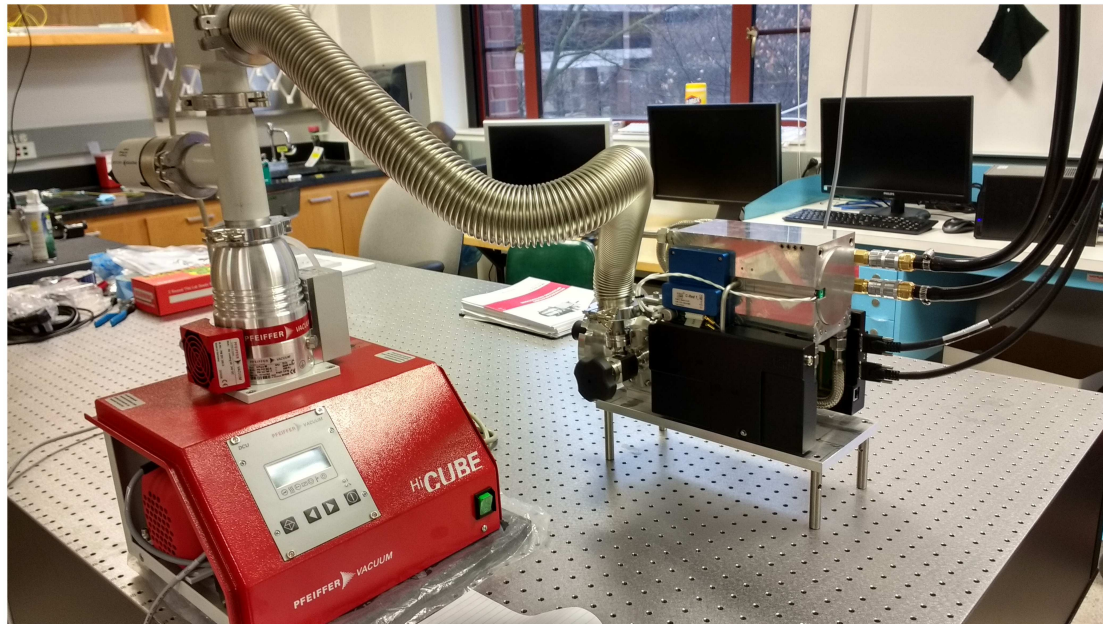
MIRCx and MYSTIC optical layout





Camera delivered

And is installed in the lab and working on understanding the detector.





MYSTIC Schedule

- 2017 Accept camera delivery (done). Prototype cryogenic version of MIRC. Design cold spectrograph and place order.
- 2018 Fully integrate system at Michigan
- 2019 (early) Deliver to CHARA, first light.

Personnel

- John Monnier (PI), Ben Setterholm (UM Grad Student), Undergrads Jacob Ennis, Mariam Haidar
- Jean-Baptiste le Bouquin (IPAG-> UM for 2 years), Cyprien Lanthermann (IPAG student working on camera optimization)
- With support from Theo ten Brummelaar & Rafael Millan-Gabet
- Also help from MIRCx team (Stefan Kraus, Narsireddy Anugu) and others.



Last words

- We are having exciting time testing the camera.
- With MIRCx and MYSTIC full J, H and K simultaneous observing.
- By the usage of cryocooled detectors reduced maintenance, no more LN2 fills!



Thank you

