



Extending ATOM's monitoring capabilities



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ATOM since 2005

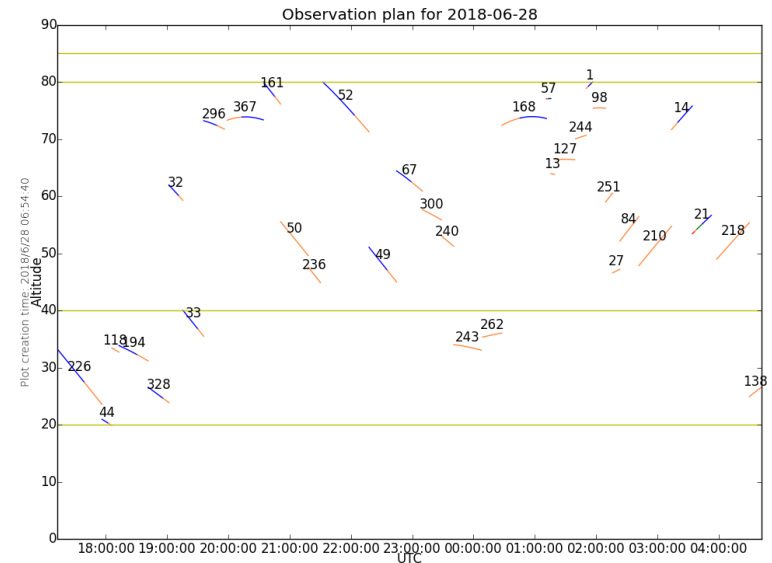
Automatic Telescope for Optical Monitoring



- dedicated optical support programme for H.E.S.S.
- located at H.E.S.S. site in Göllschau, Namibia
- operating since 2005
- monitoring of ~ 300 known γ -ray emitters
- also serving as optical support for Target-of-Opportunity programmes
- ATOM is not a wide-field imager. ATOM is a precise photometer.

Classic observation procedure

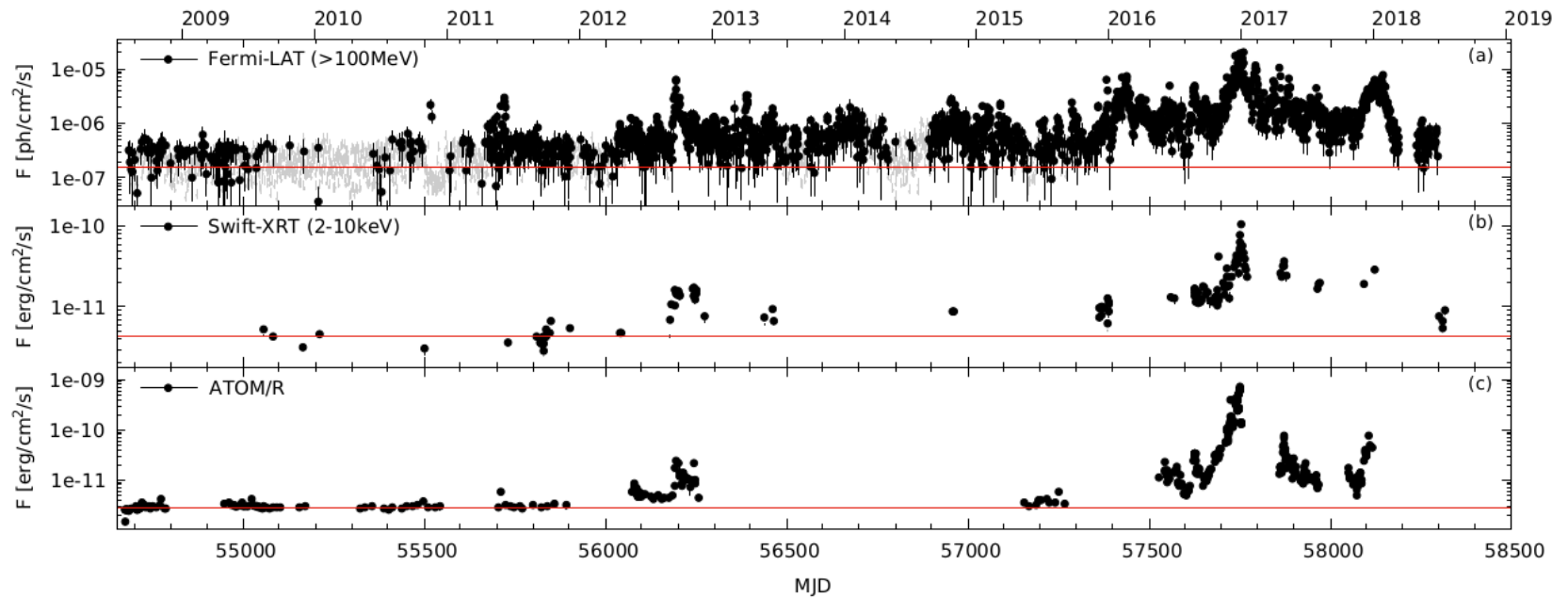
- observation target chosen by algorithm based on various parameters (position, duration, importance, previous observations, ...)
- target is observed robotically
- data analysed by automatic pipeline
- results available next morning



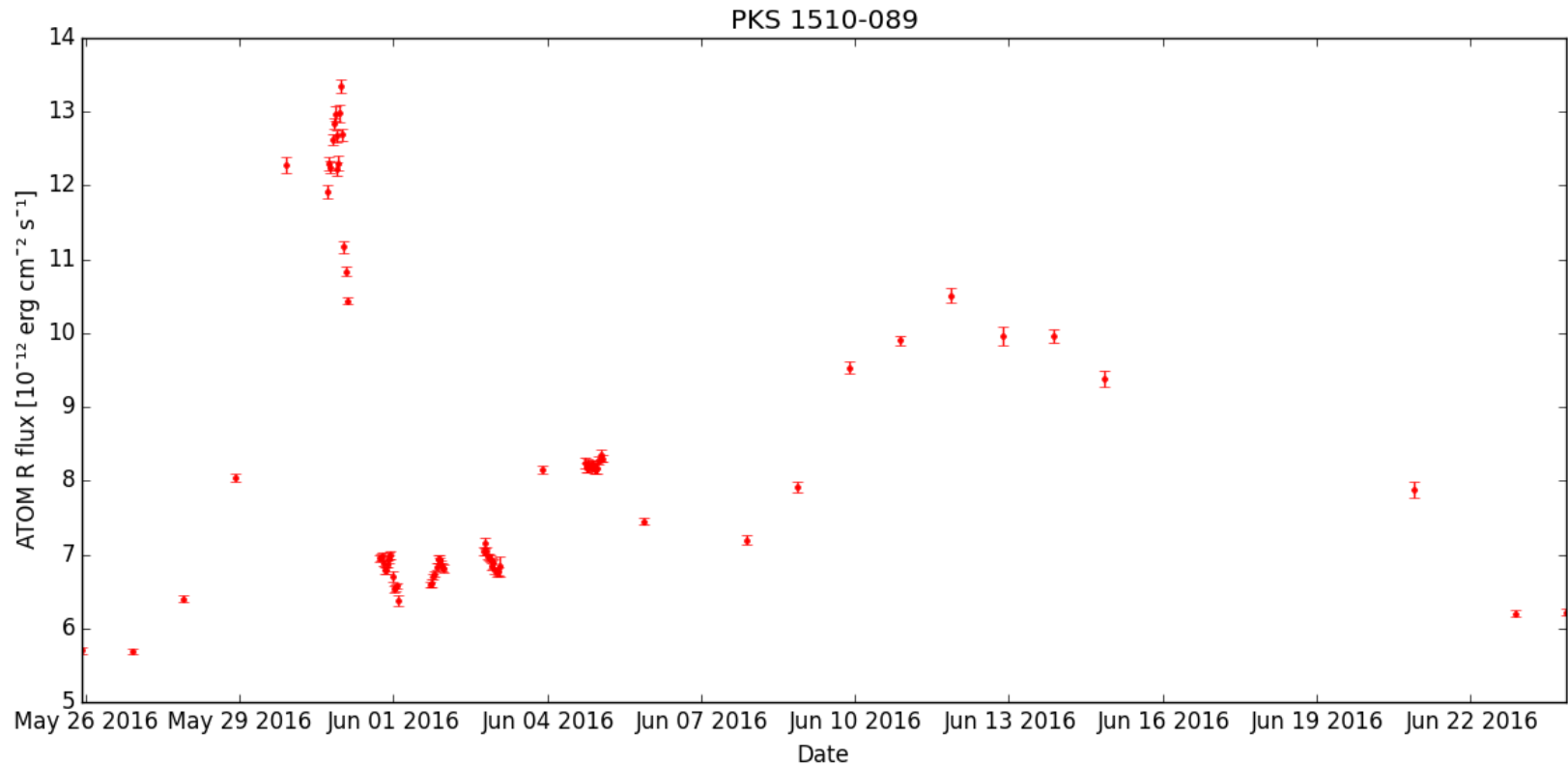
Long-term monitoring (PKS 2155-304)



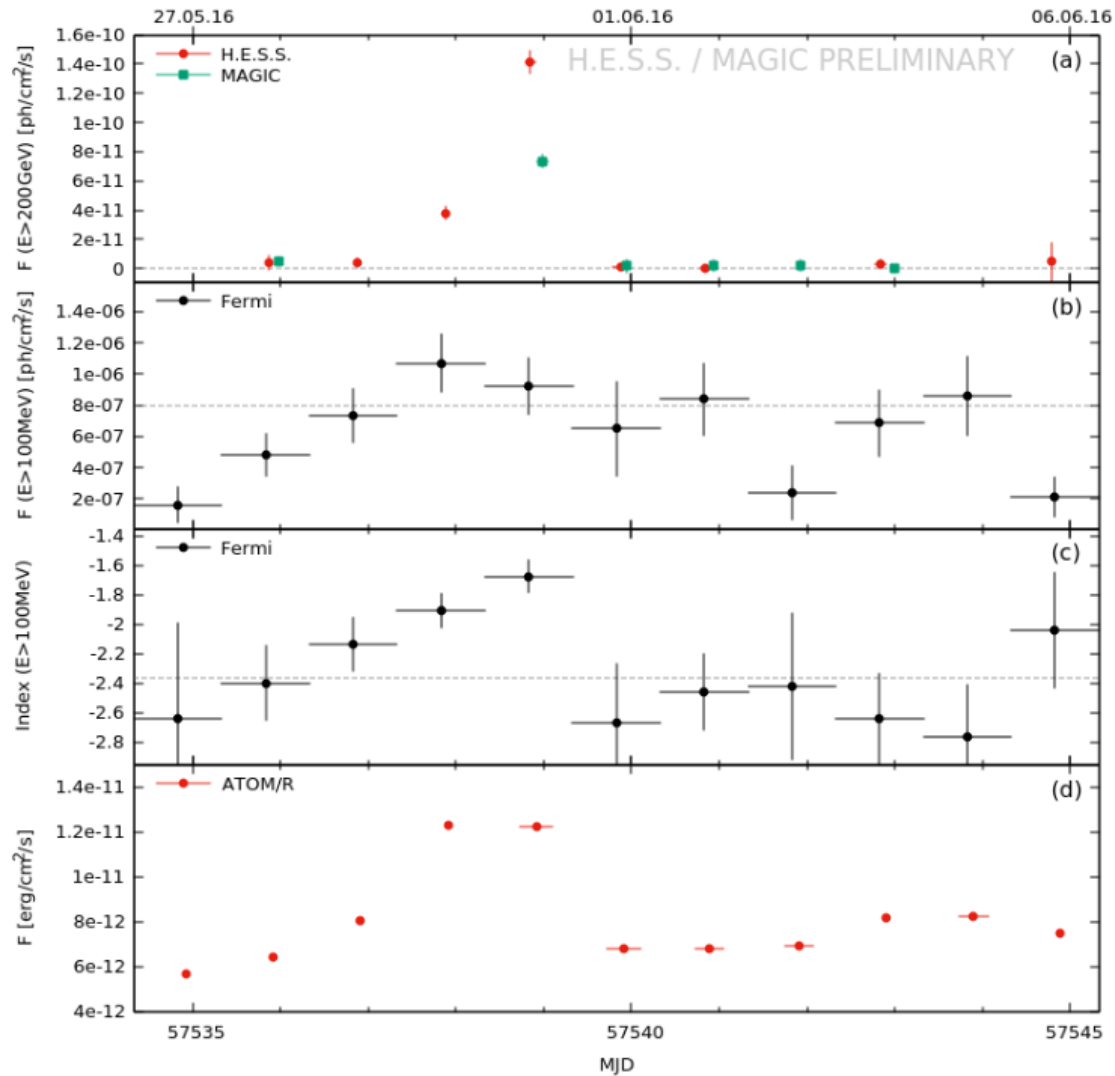
In multi-wavelength context (CTA 102)



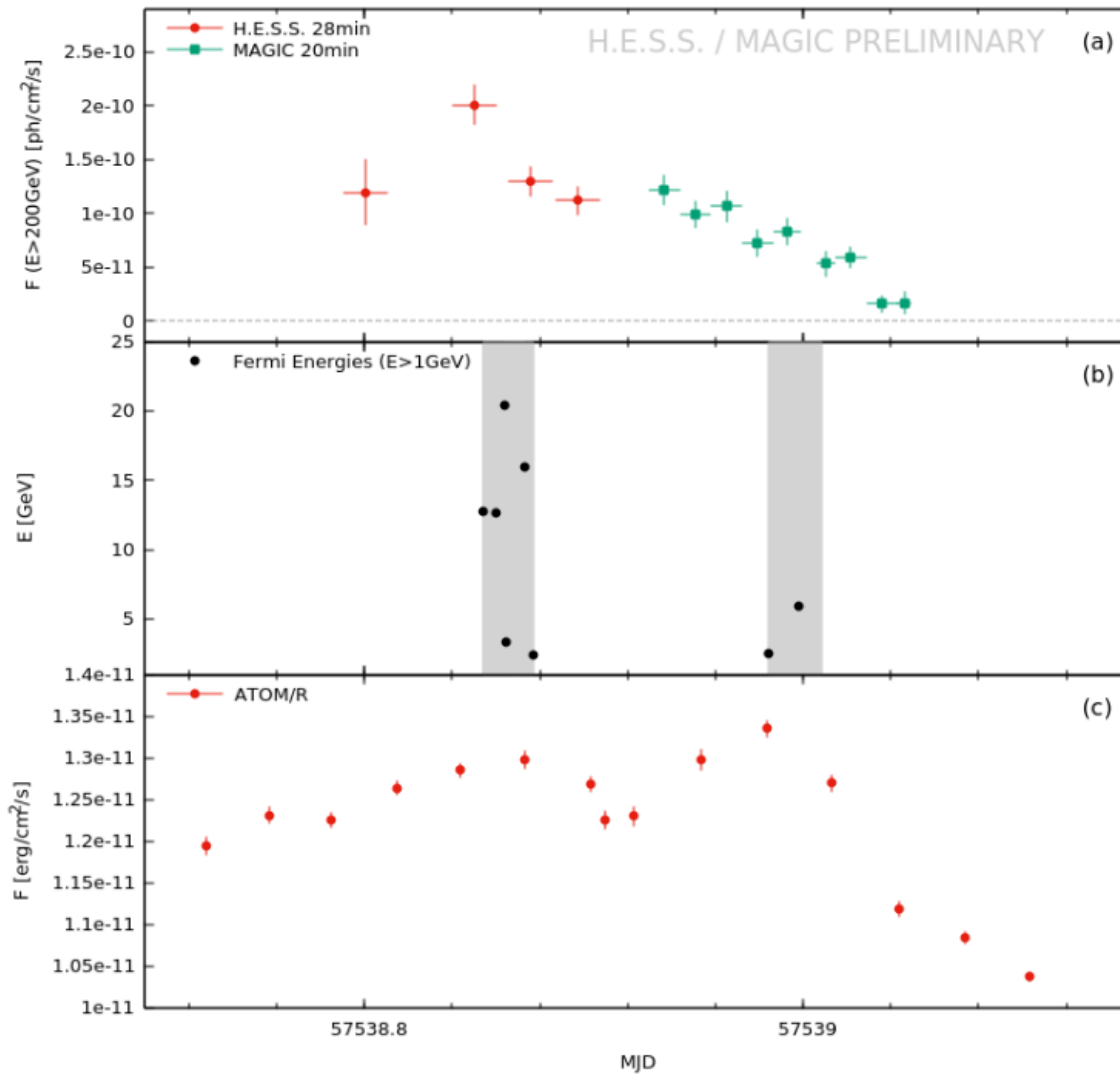
Intra-night monitoring (PKS 1510-089)



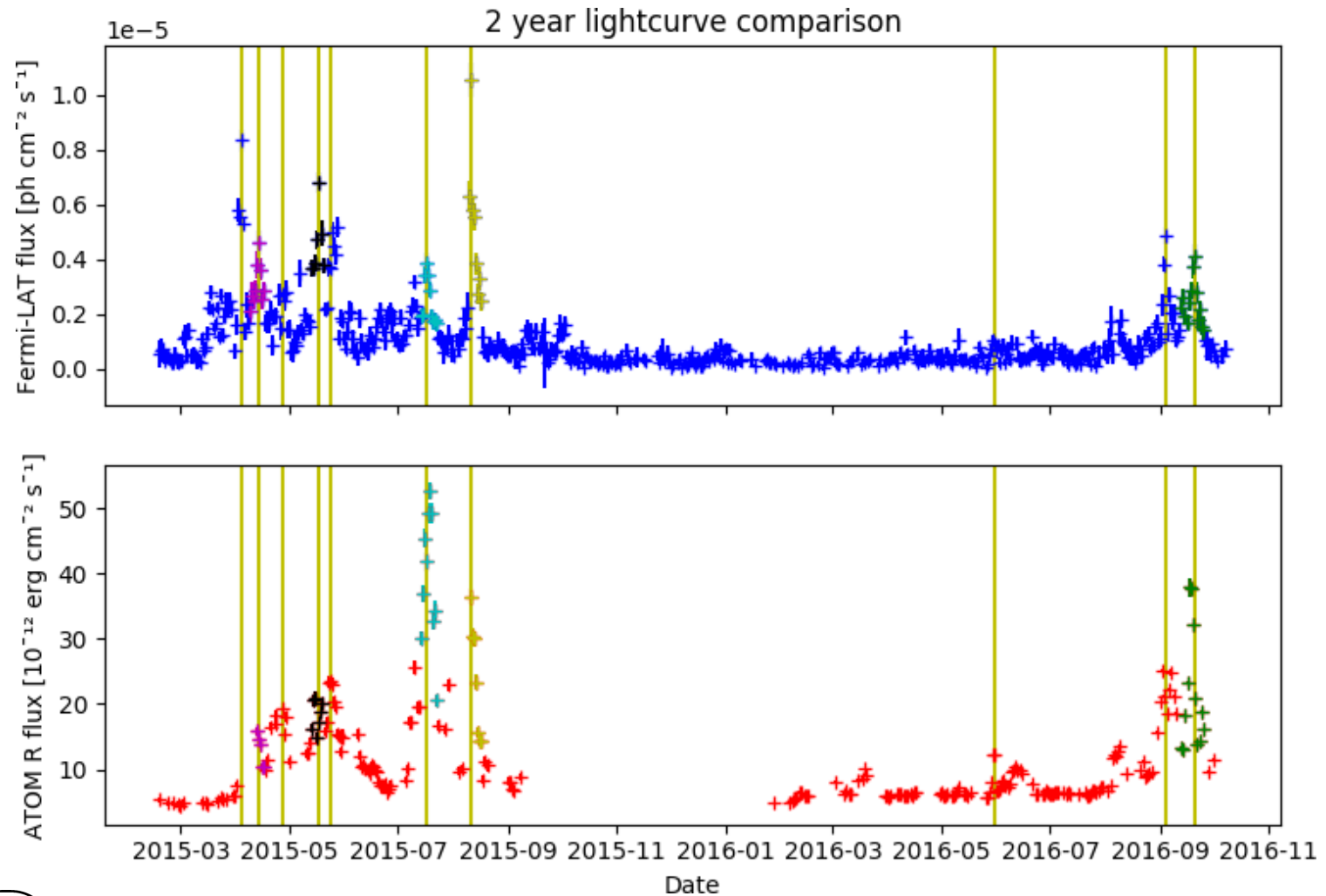
Intra-night monitoring (PKS 1510-089)



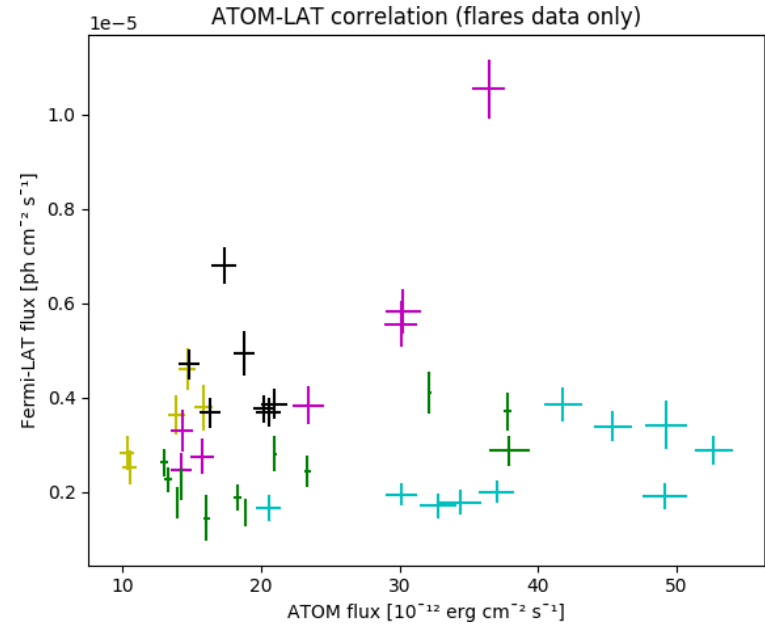
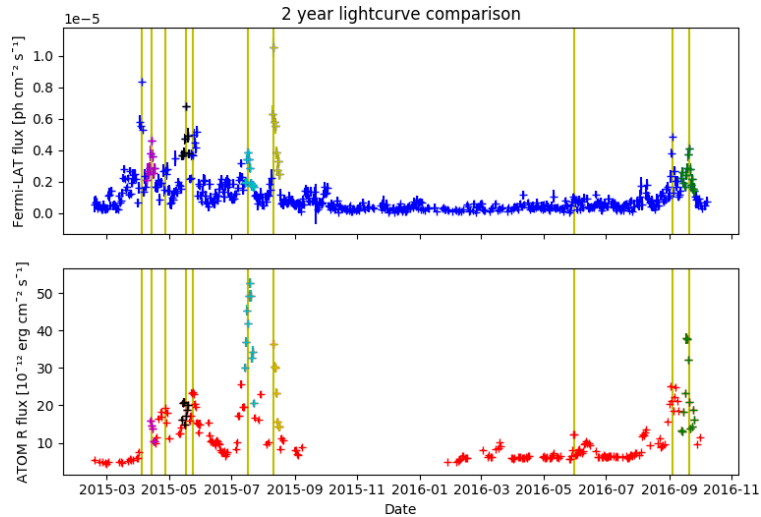
Intra-night monitoring (PKS 1510-089)



Two dense monitoring programmes (PKS 1510-089)



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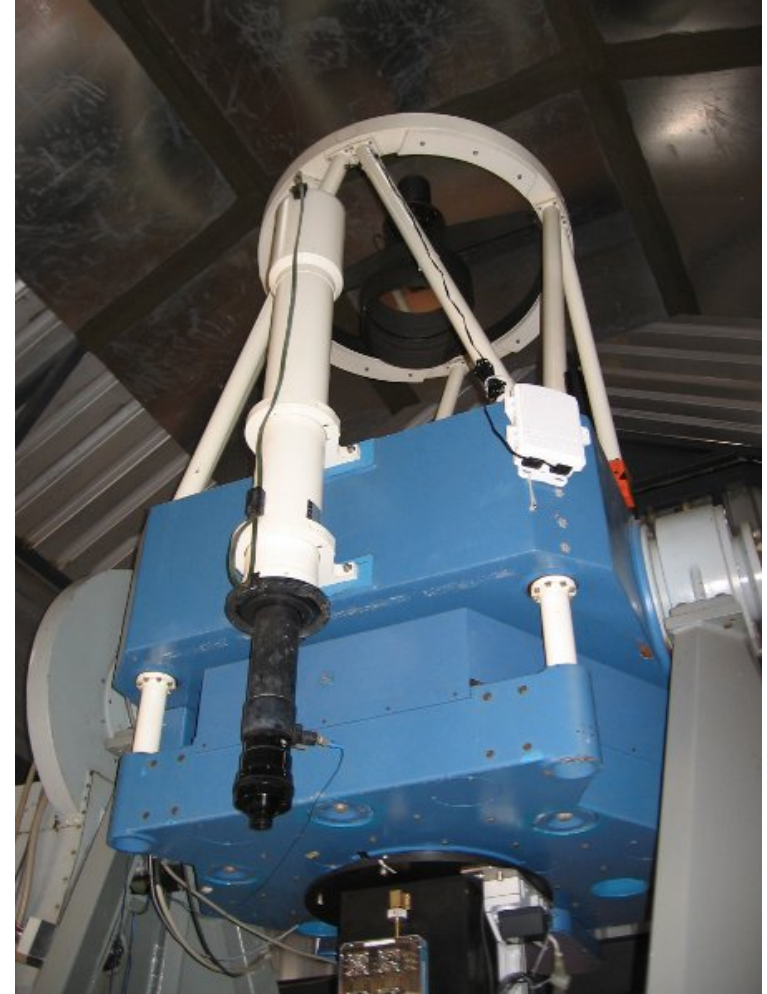


→ *PoS(IFS2017)034*



Motivation for instrument upgrade

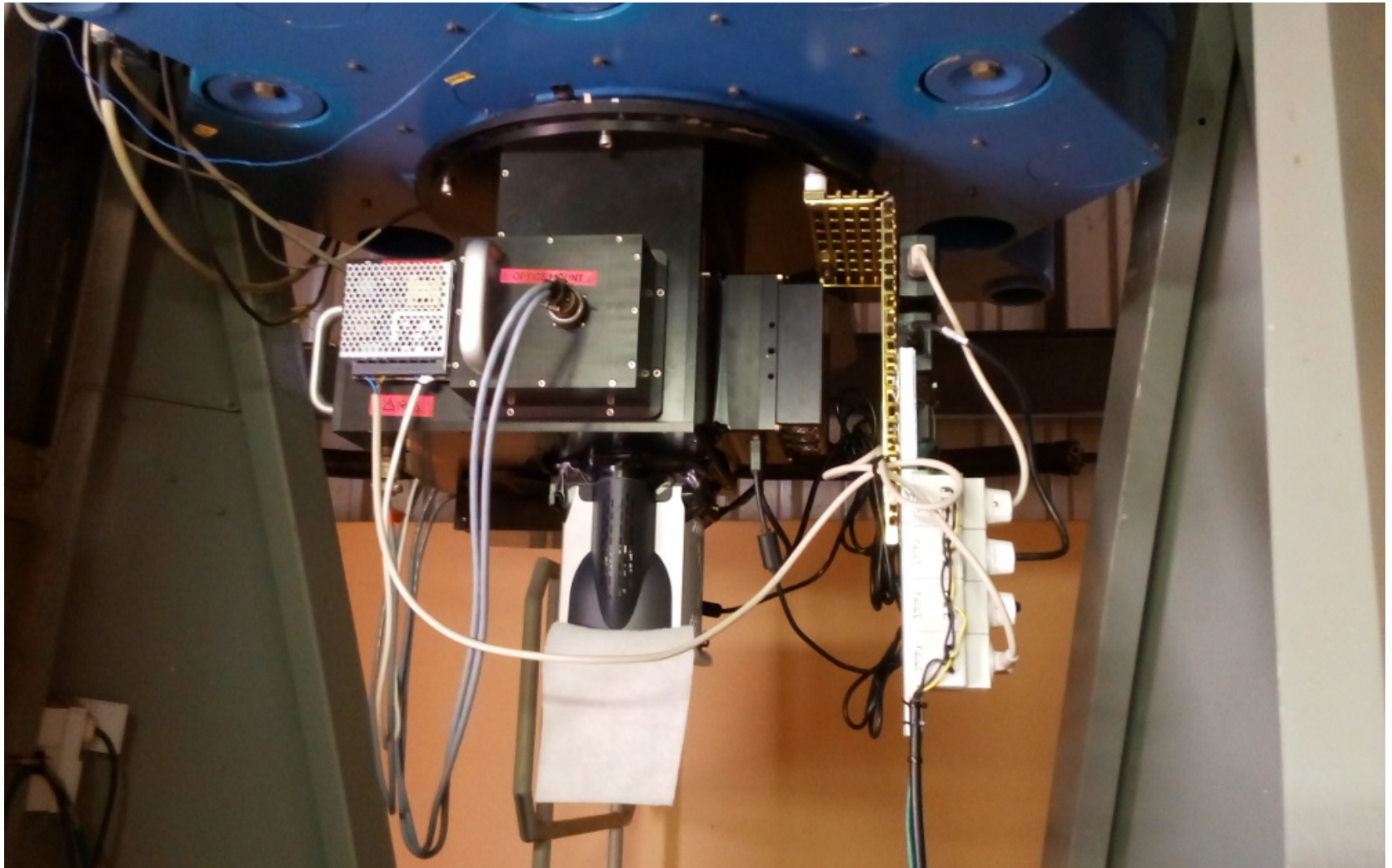
- growing list of monitoring targets adds pressure on schedule
- short-term variability monitoring conflicts with multi-band observations
- inflexibility in temporal resolution (inherent to optical telescopes)
- ATOM can reach high temporal resolution, but not sub-second
- growing interest in polarisation characterisation of γ -ray emitters





**Let's build the perfect optical
support instrument**

ATOM's new instrument



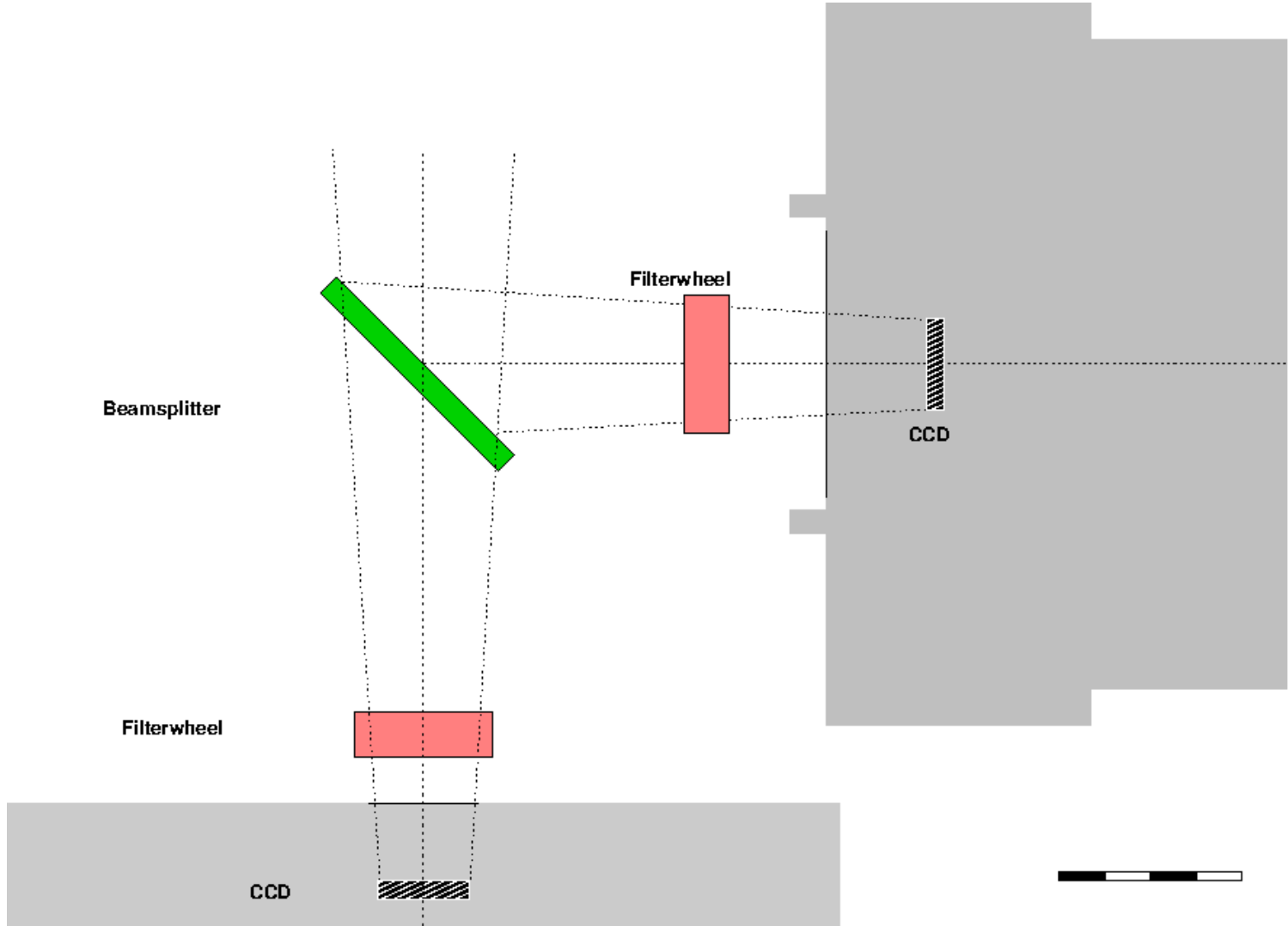


ATOM's new instrument

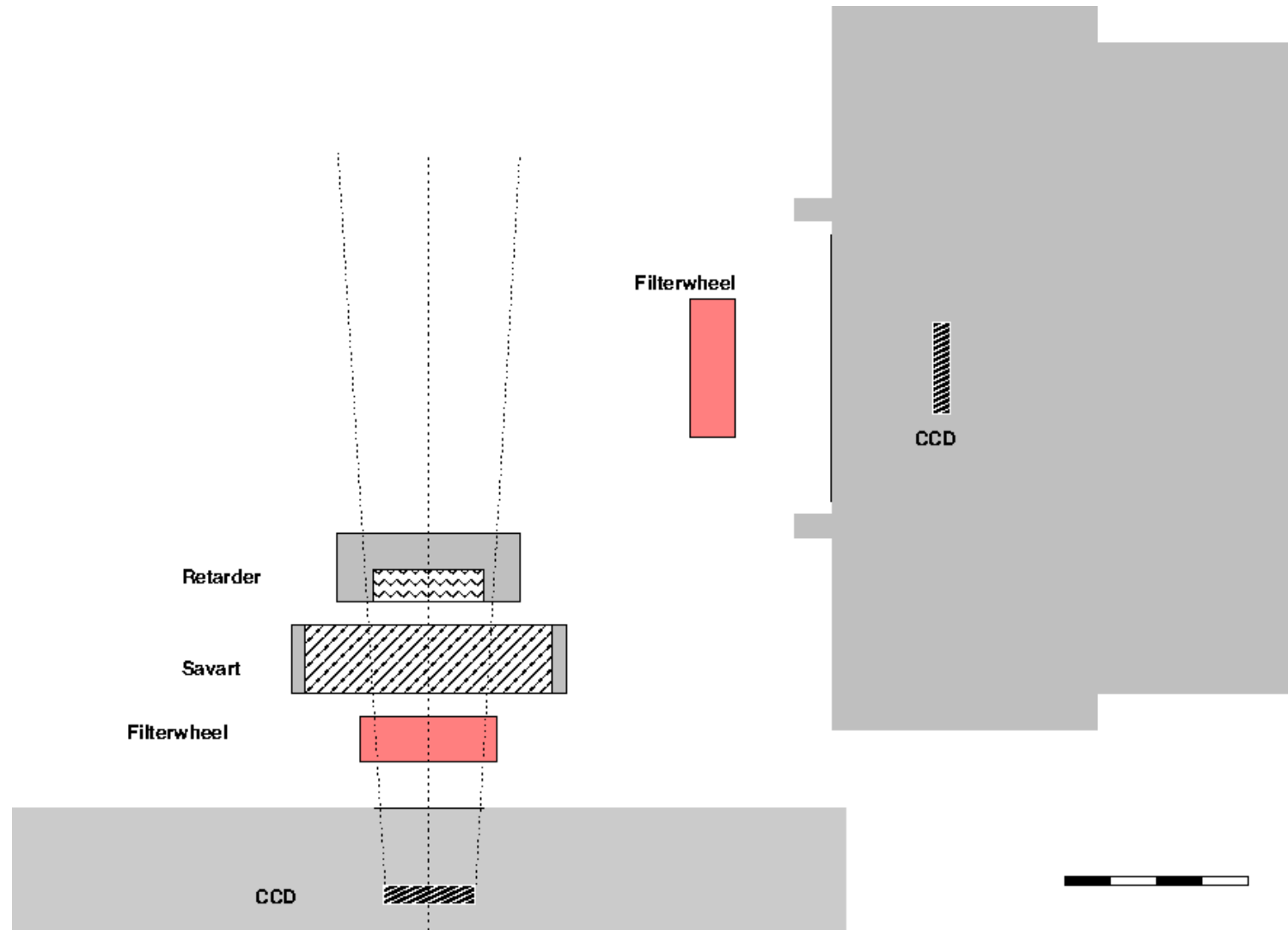
Wishlist:

- modular
- multi-band photometry
- high time-resolution photometry
- polarimeter

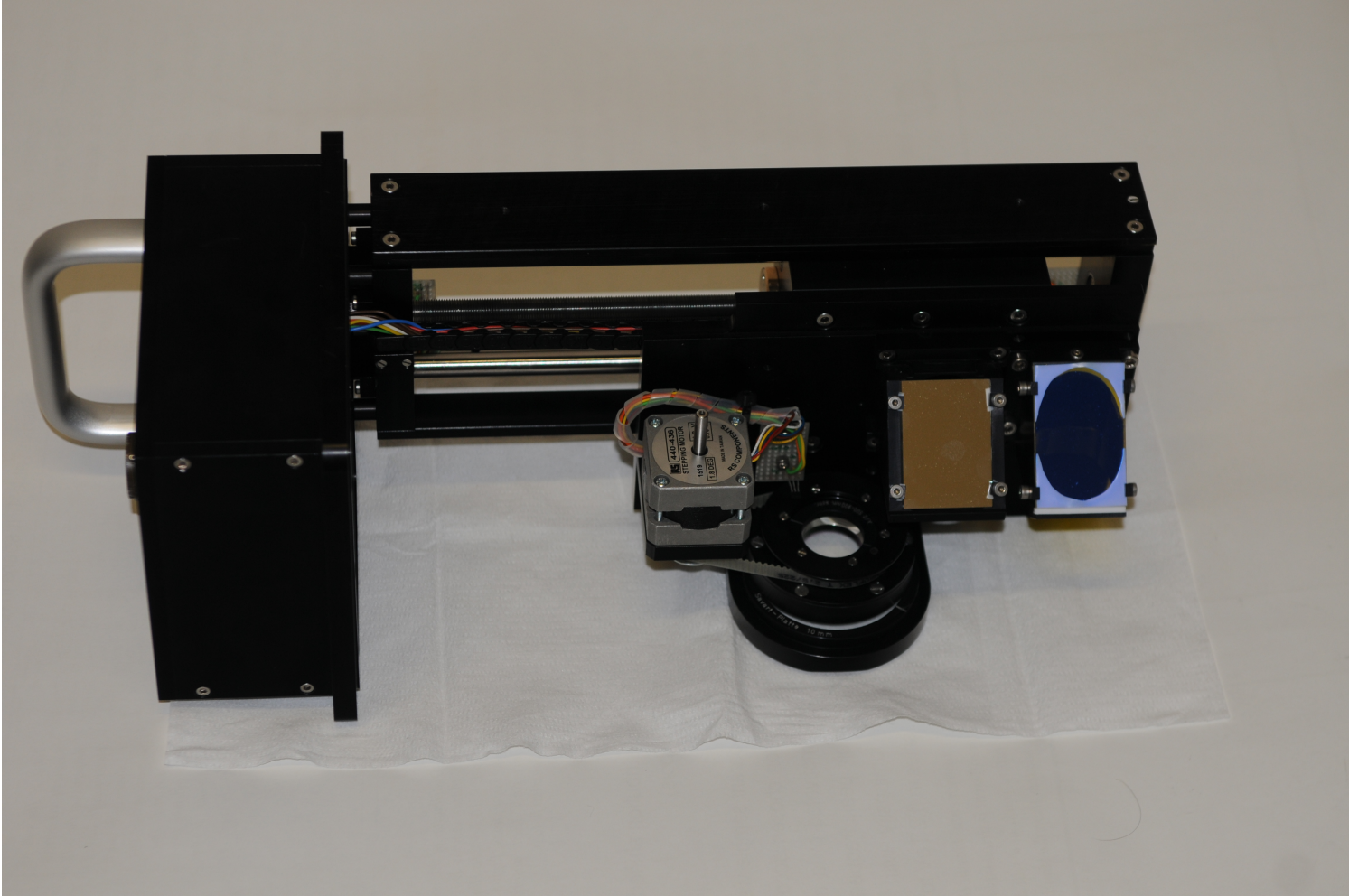
Main beam paths



Main beam paths

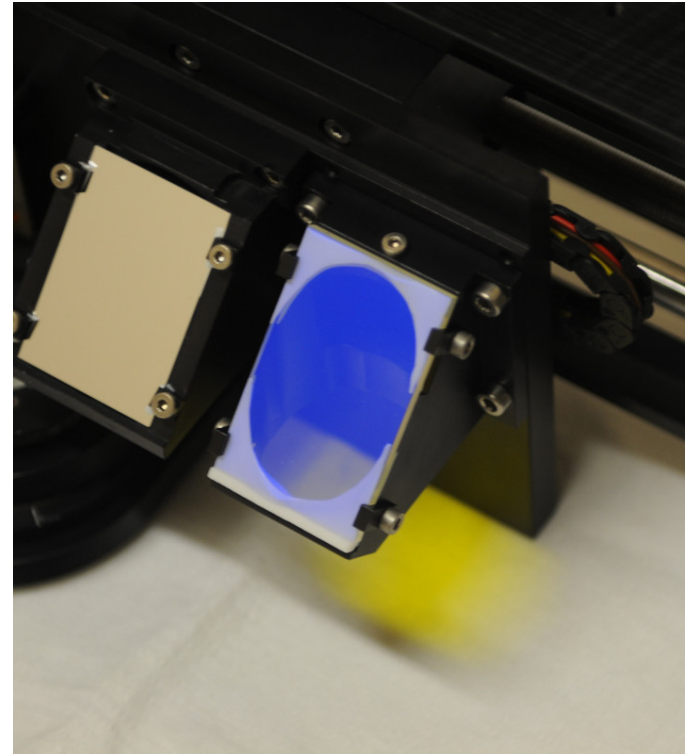


Main beam paths



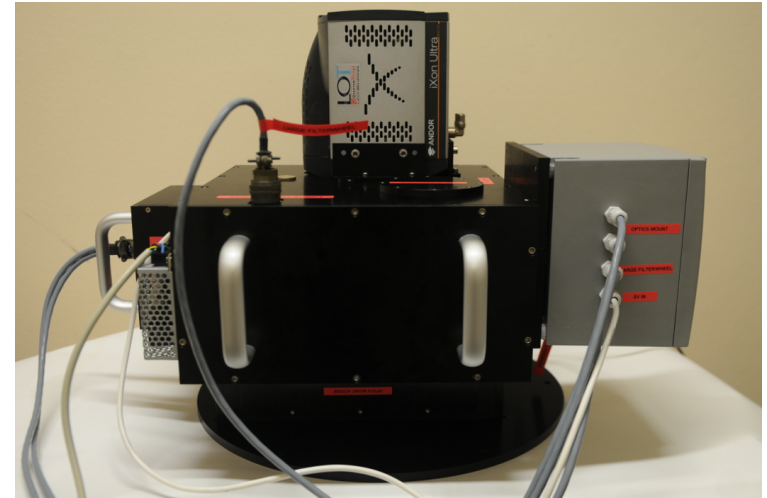
Multi-band observations

- beamsplitter separates B from V, R, I
- standard observations measure B and R concurrently
- R flux measured in short intervals (currently 30 seconds)
- observe both short-term variability as well as second colour band

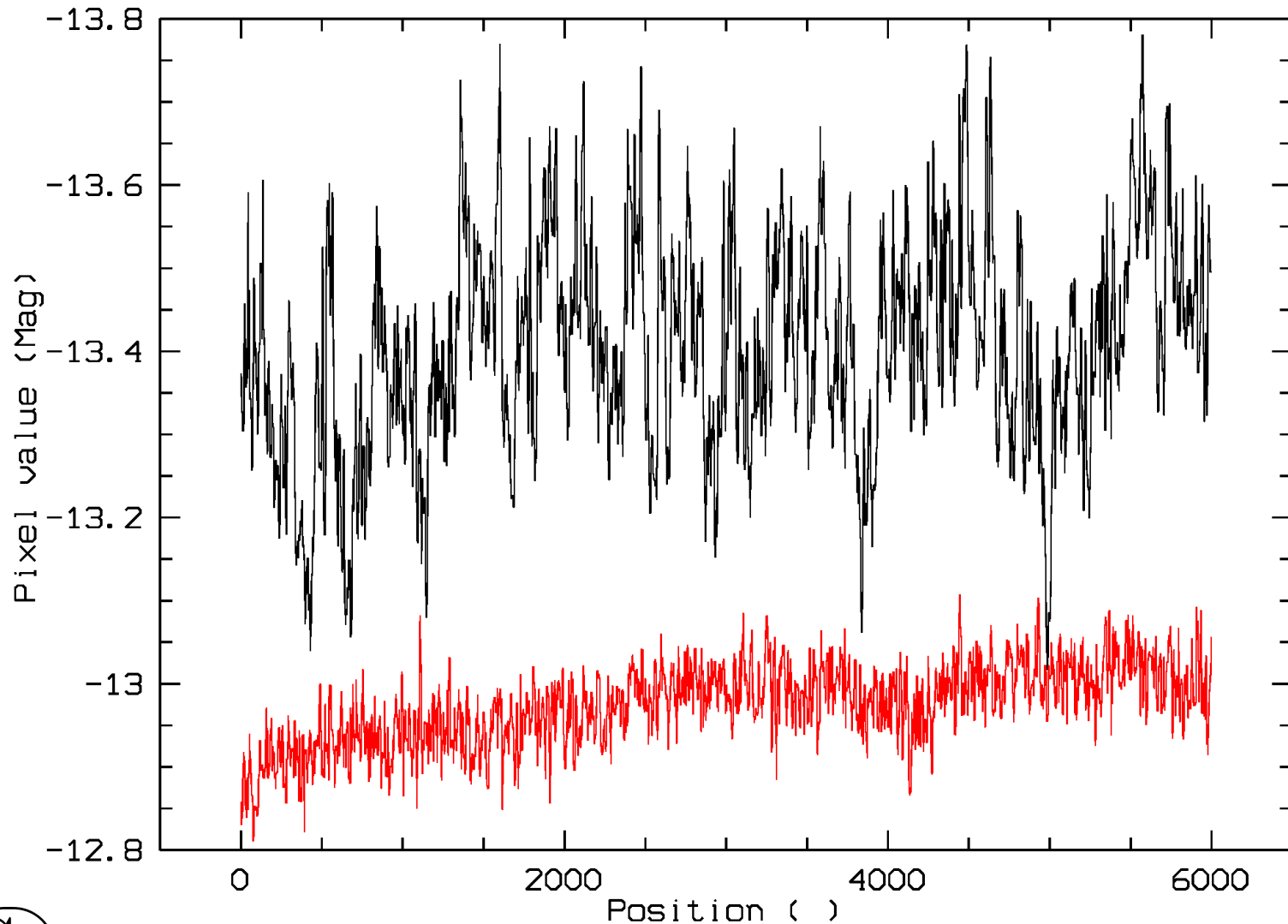


High temporal resolution

- EMCCD = Electron Multiplying CCD
- capable of frequent readouts with no significant cost in S/N
- dead-time between exposures < 5ms
- currently tested on sky: 100ms intervals



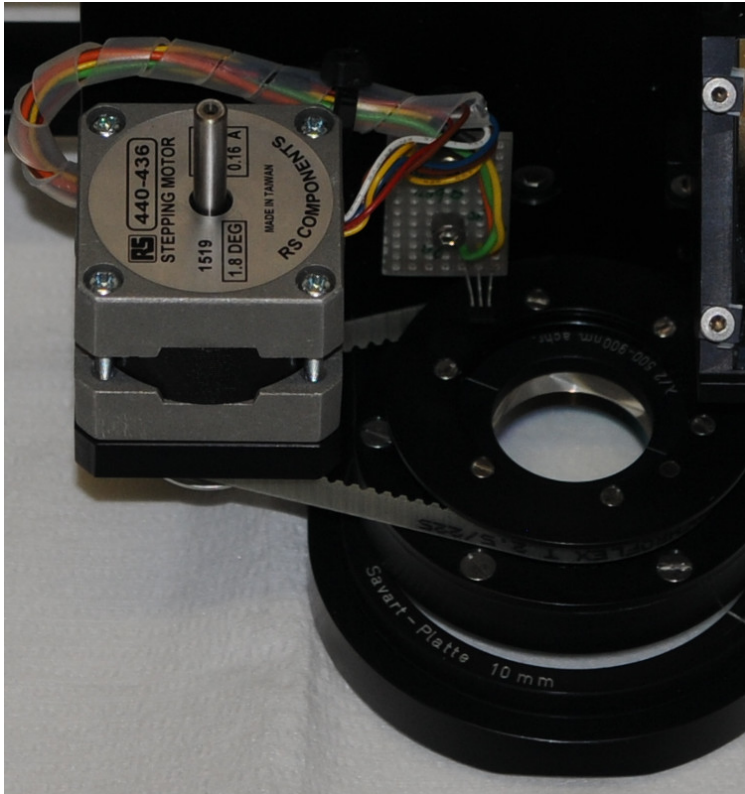
High temporal resolution (MAXI J1820+070)



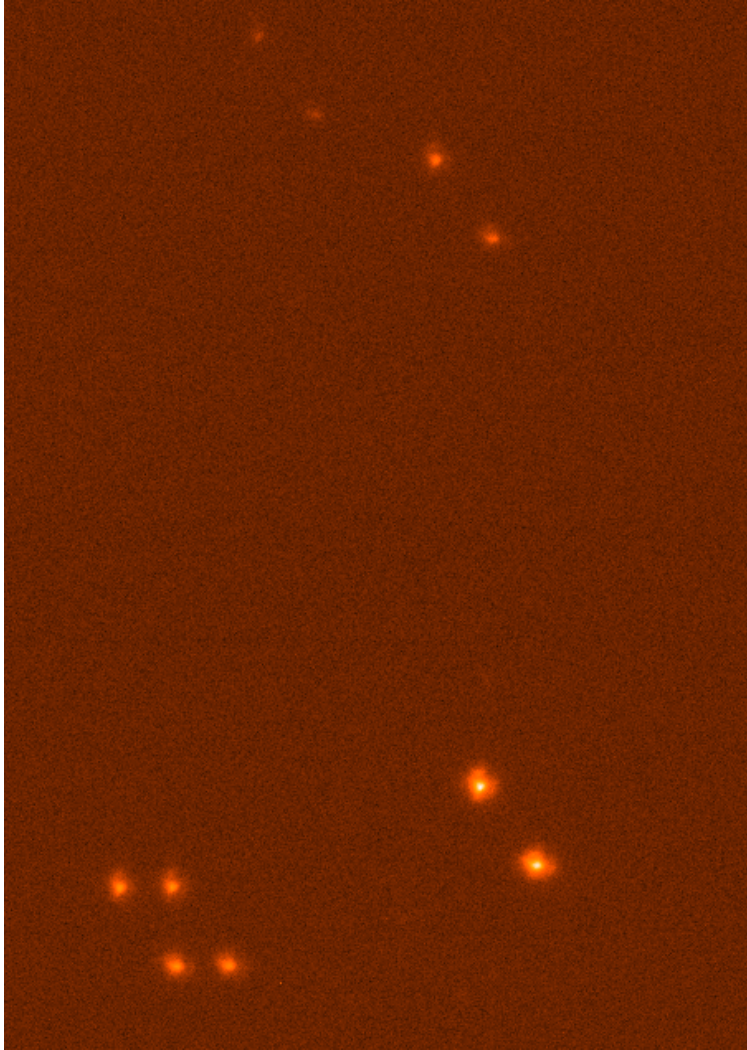
High temporal resolution (MAXI J1820+070)



Polarimetry



- polarimeter designed around Savart plate
- highly flexible
- little requirements on target field



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Current status

- instrument has been installed and is undergoing commissioning
- all observation modes are available for robotic operation
- currently characterising performance
- automatic analysis chain in development
- at same time: traditional monitoring programme continues

