

Discovery space and science with the PLACID stellar coronagraph

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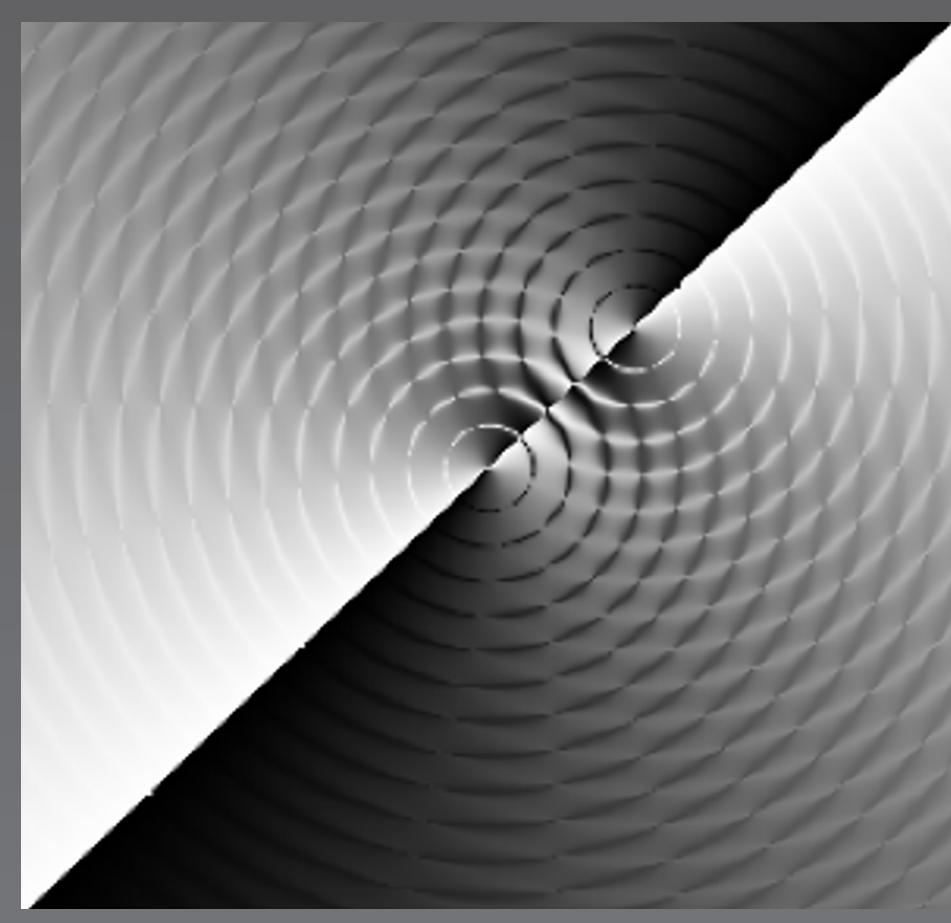
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Introduction

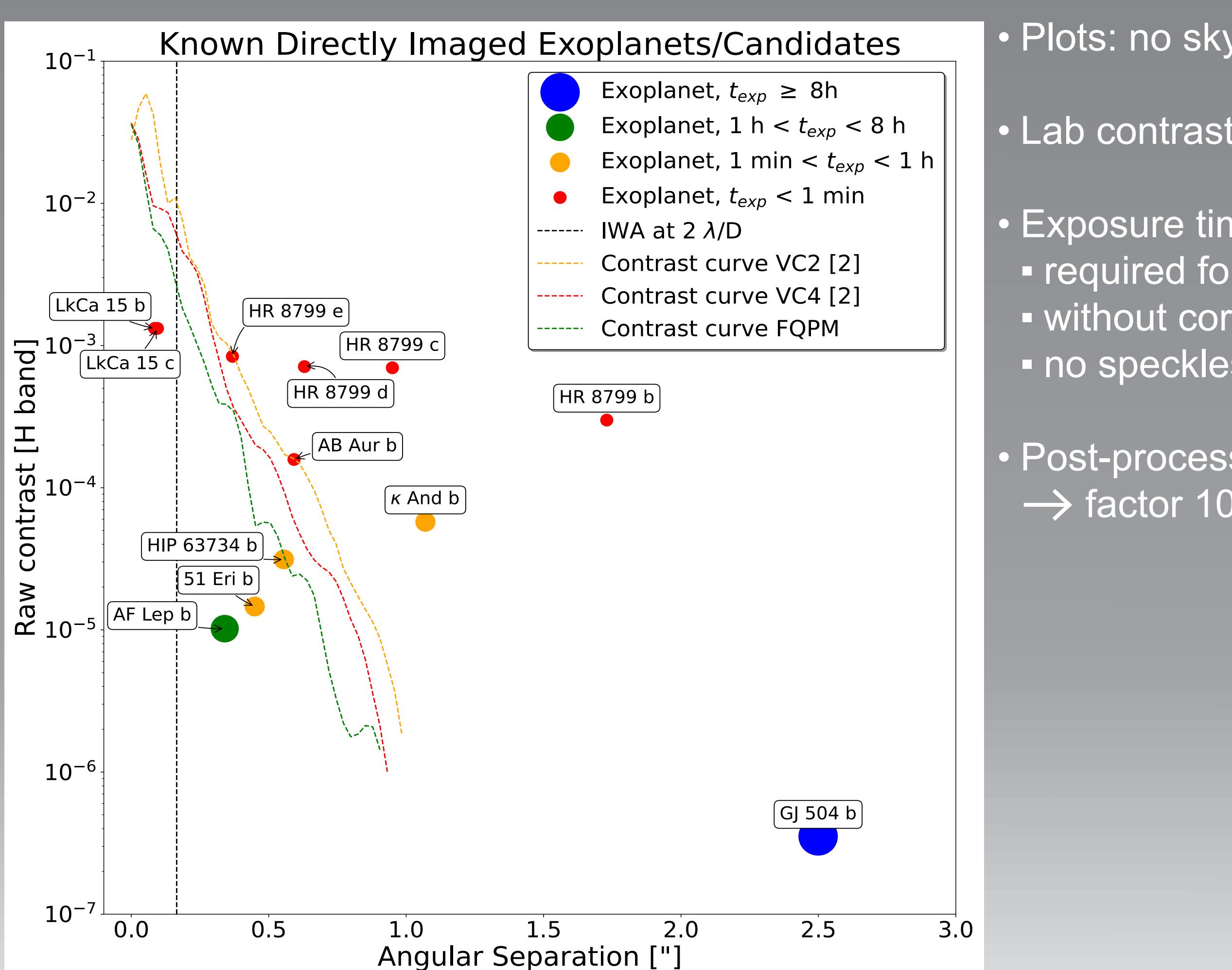
- PLACID (Programmable Liquid-crystal Active Coronagraph Imager for the DAG telescope) is a coronagraphic instrument, providing adaptive high-contrast imaging capabilities from H - to Ks - band
- PLACID uses a pixelated Spatial Light Modulator (SLM) to generate coronagraphic focal-plane masks (FPMs) for the first time on a telescope (4 m, DAG observatory, Erzurum, Turkey)
- Instrument delivered in March '24, first light expected by end of 2024
- Remote reconfiguration on-demand to adapt to e.g. observing conditions, multiple star coronagraphy, correcting aberrations, segmented primary mirrors (ELTs, HWO, ...)



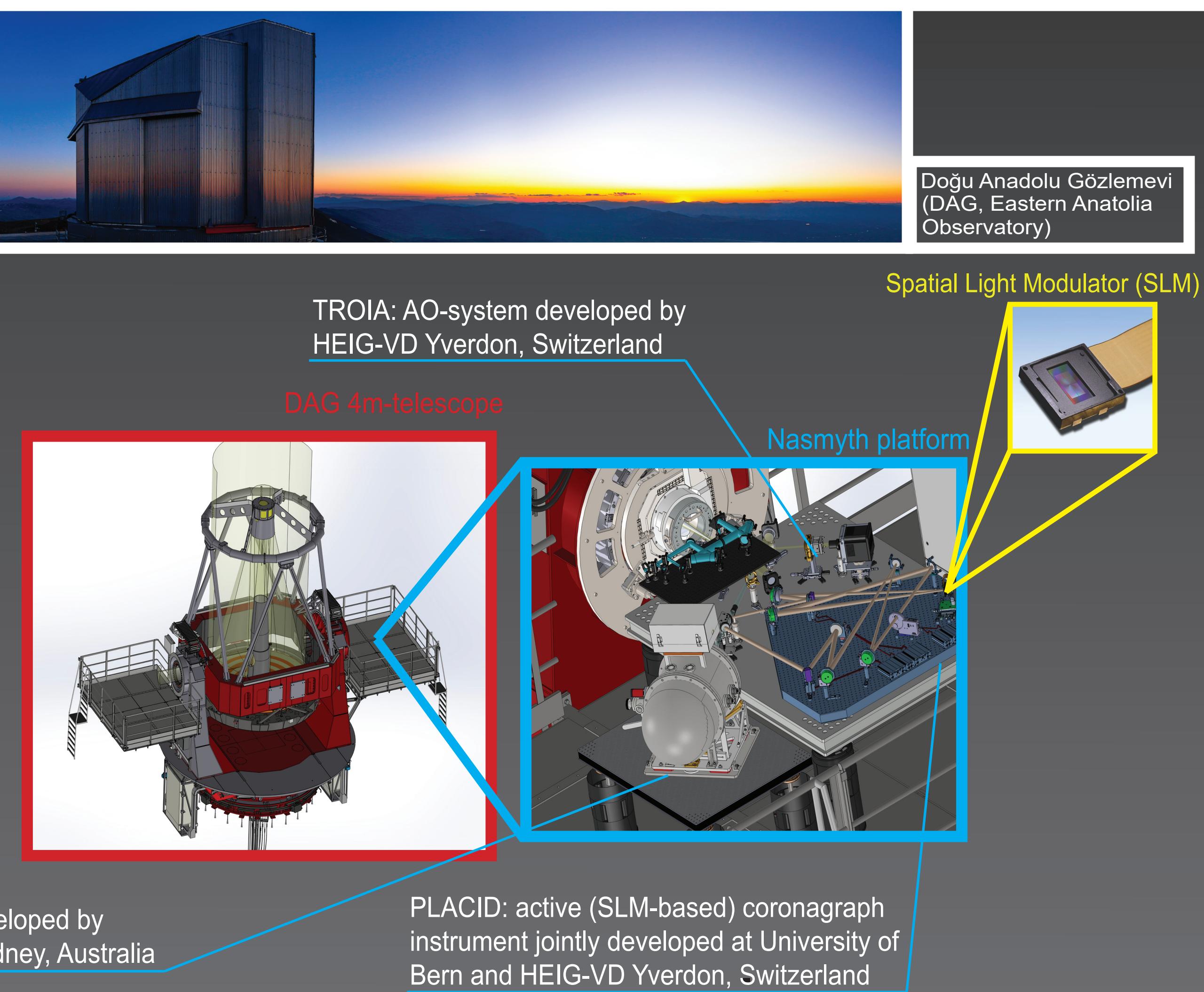
Vortex FPM ($n=2$) programmed for a binary star (can be rotated in time to perform ADI) [1]



Have a look at a related poster on simulations of an SLM-based coronagraph!

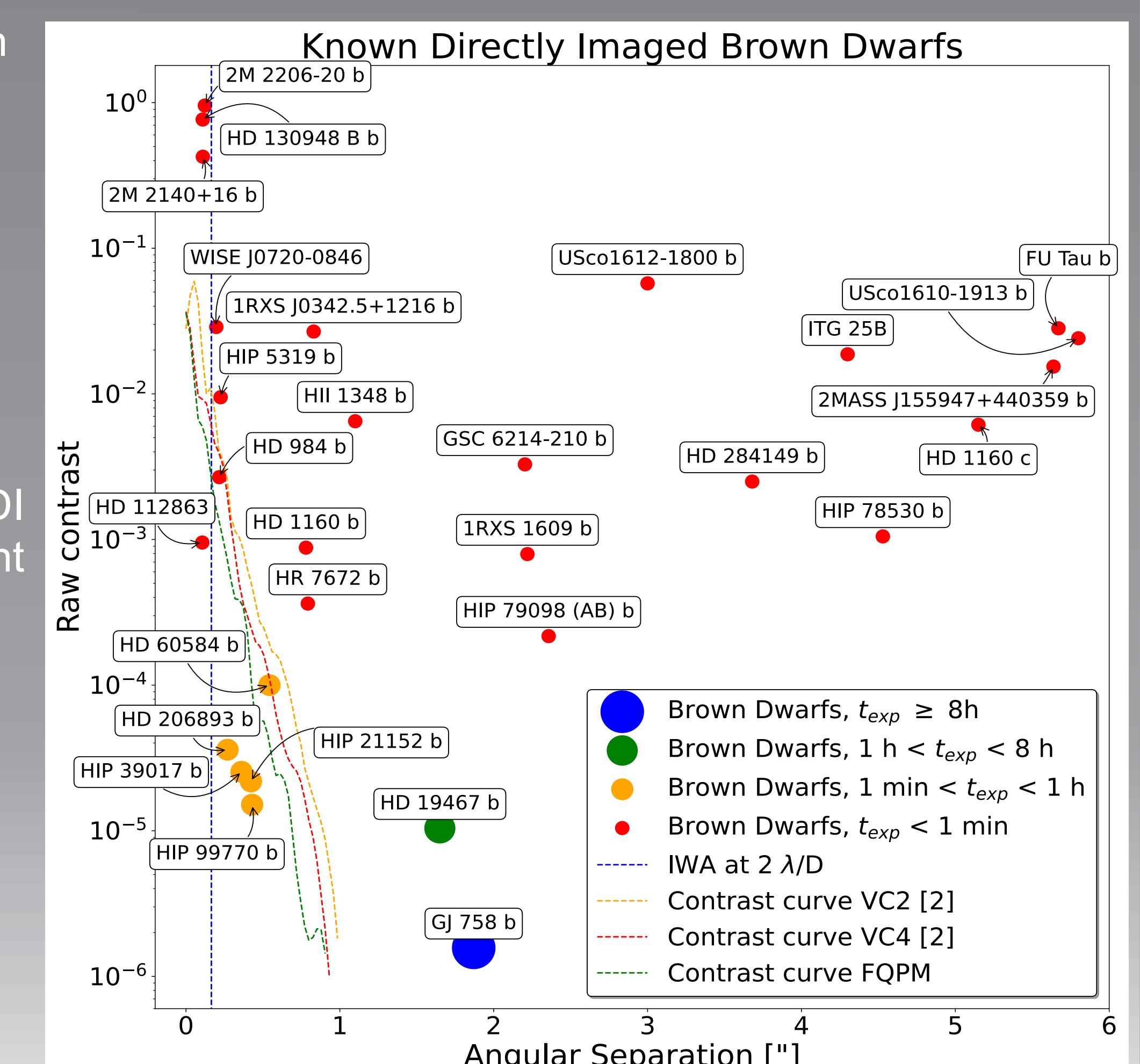


- Plots: no sky degradation
- Lab contrast curves
- Exposure time t_{exp}
 - required for $\text{SNR} = 5$
 - without coronagraph
 - no speckles
- Post-processing, ADI, CDI
→ factor 10 improvement



PLACID targets and discovery space

- Known exoplanets / candidates, Brown Dwarfs, circumstellar disks, binaries/triples
- Gaia, TESS, PLATO direct-imaging follow-ups in the North
- PLACID observational constraints:
 - Site: DEC: $\geq -24^\circ$
 - TROI-AO guide star: $V \leq 13\text{ mag}$
 - On-sky FOV: $16'' \times 9.6''$



Outlook

- Obtaining on-sky contrast curves for PLACID
- Data reduction pipeline

References

[1] Jonas G. Kühn et al. SLM-based digital adaptive coronagraphy: current status and capabilities. *Advances in Optical and Mechanical Technologies for Telescopes and Instrumentation III*, volume 10706 of SPIE Conference Series, page 107062N, July 2018. doi: 10.1117/12.2312554.

[2] Jonas G. Kühn et al. SLM-based Active Focal-Plane Coronagraphy: Status and future on-sky prospects. arXiv e-prints, art. arXiv:2102.03201, February 2021. doi: 10.48550/arXiv.2102.03201. 1