

Mid-infrared coronagraphy with the Annular Groove Phase Mask

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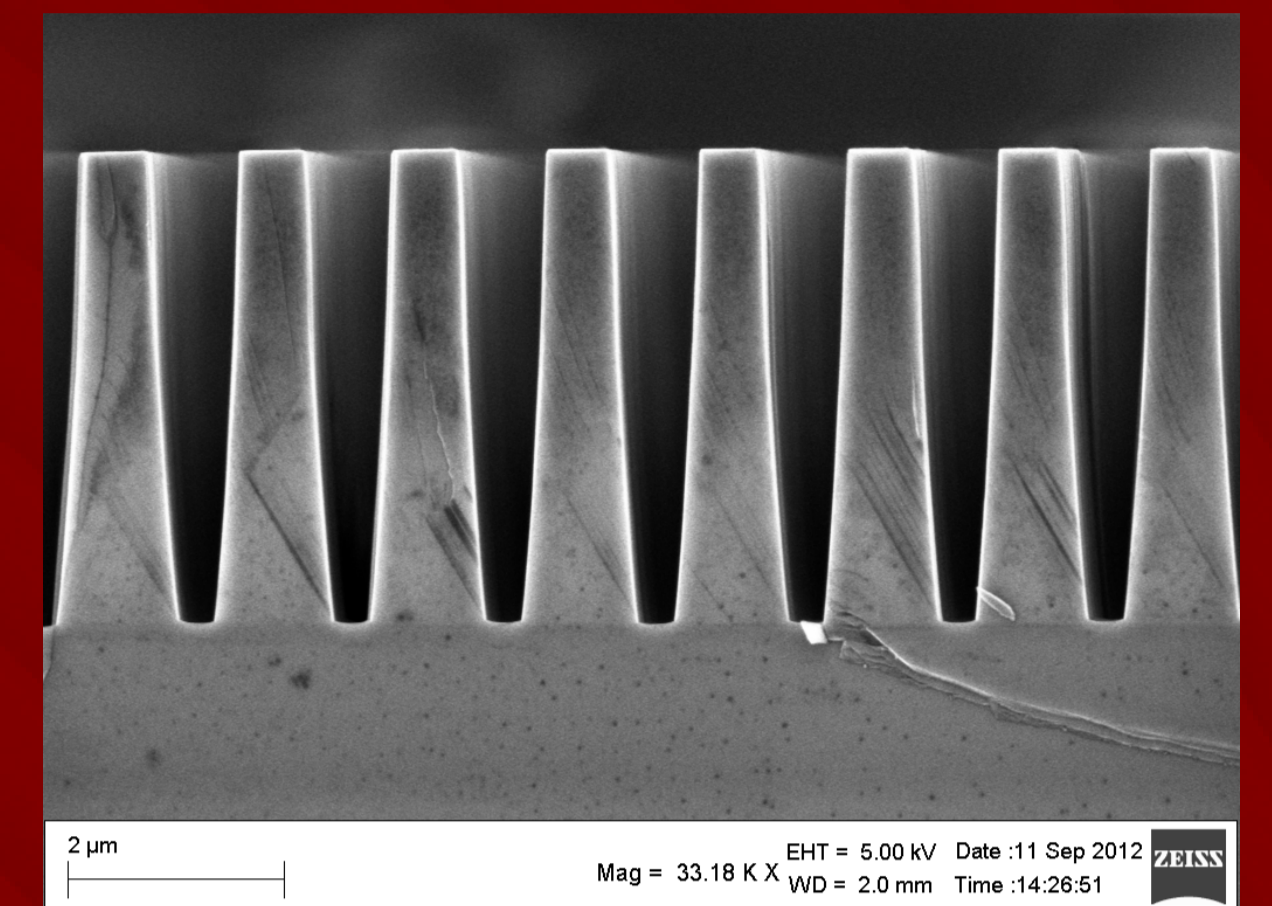
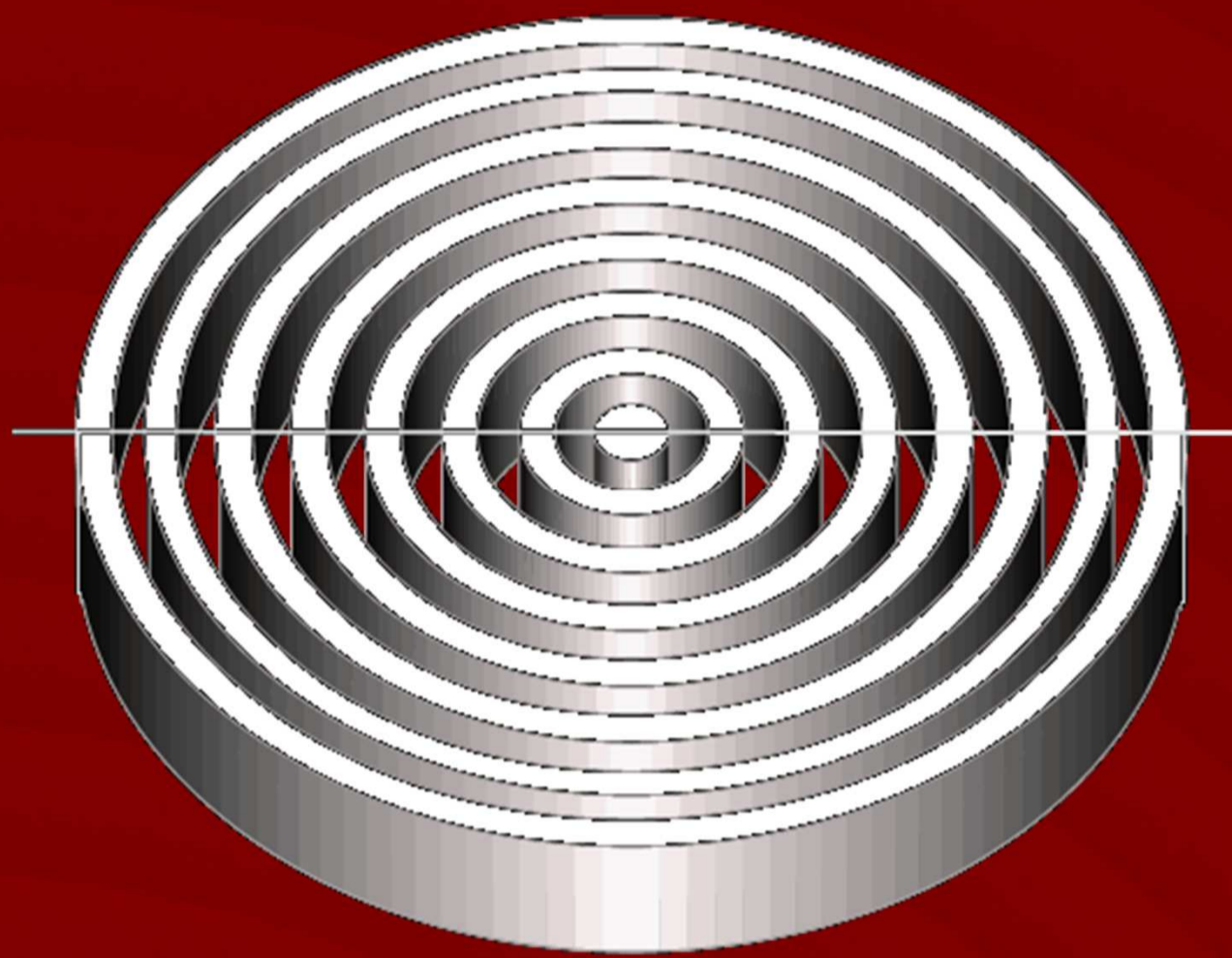
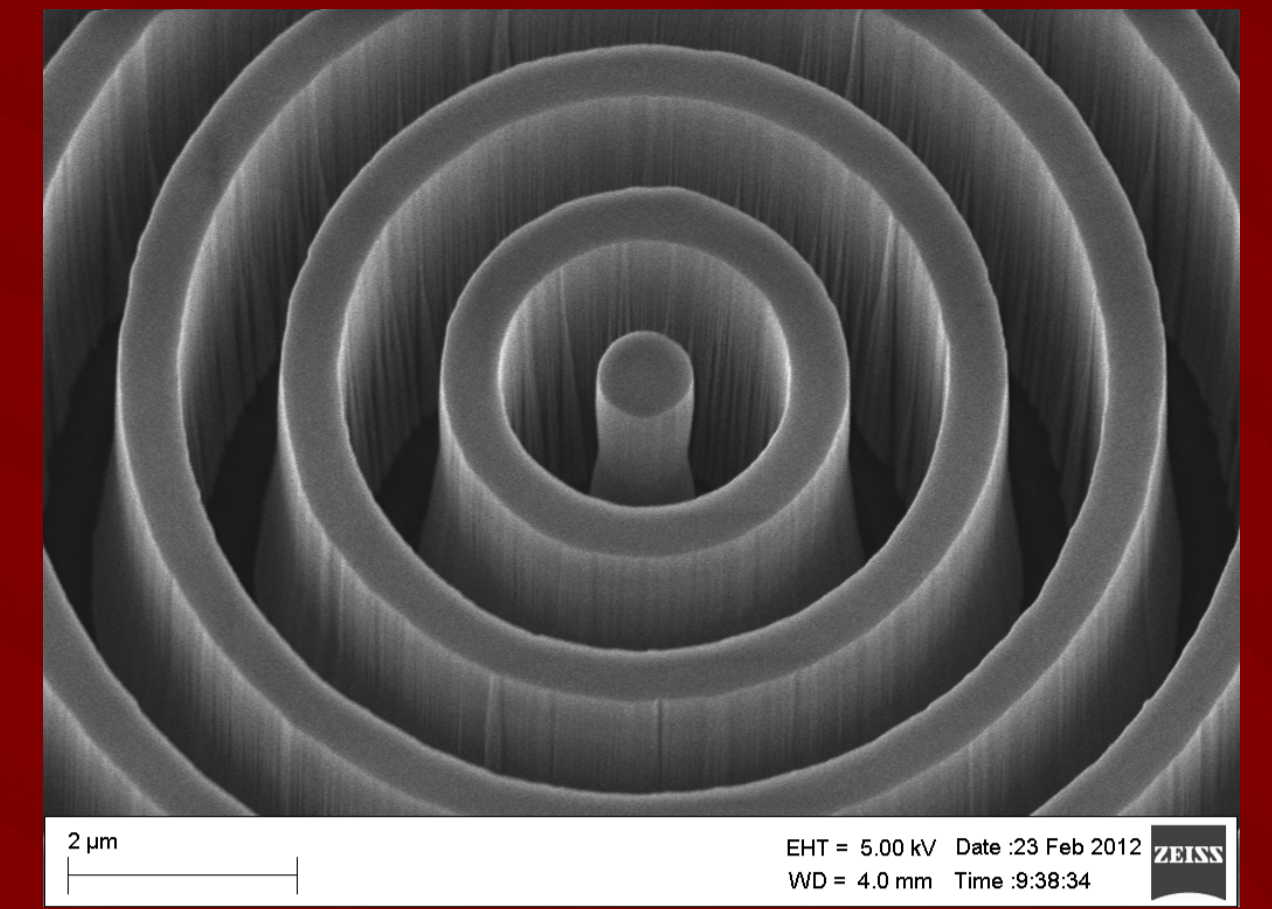
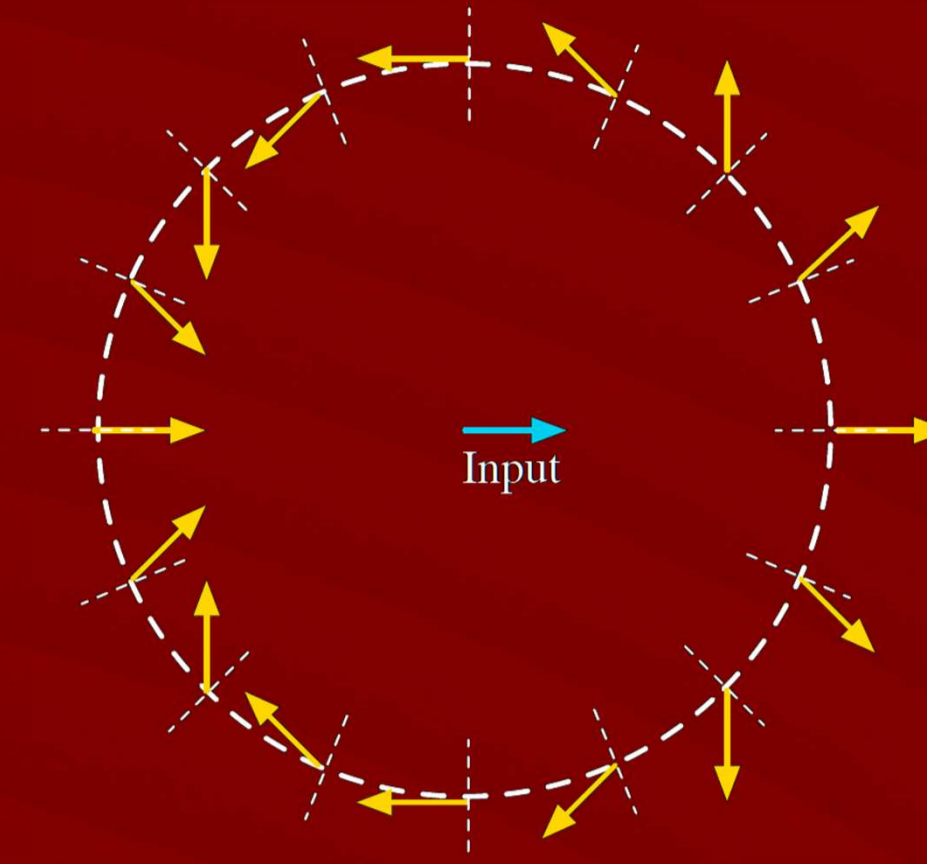
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The AGPM in a nutshell

Mawet et al. 2005

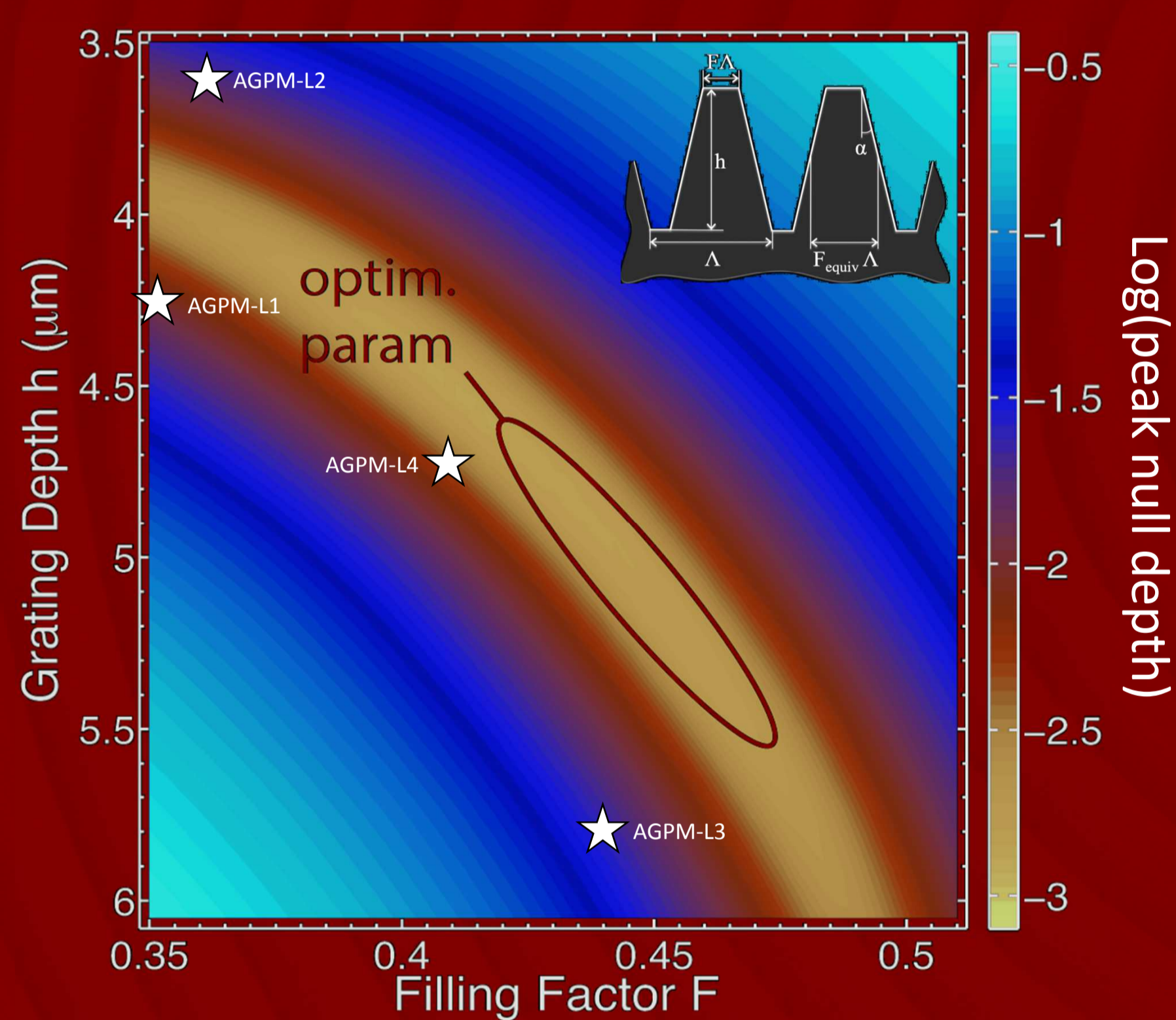
- First proposed Vector Vortex Coronagraph
 - Circularly symmetric half-wave plate → synthesises a 4π phase ramp
 - Made of concentric subwavelength grating etched onto diamond substrate
- Excellent discovery space
 - 360°, clear field-of-view
 - Inner Working Angle = $1 \lambda/D$
 - Outer Working Angle only limited by the instrument field-of-view
- Achromatic → broadband operation
 - L-band and N-band components produced so far
- High transmission in near- and mid-IR
 - Intrinsic transmission $\sim 90\%$ for AGPM (with 2D AR structure on back side)
 - Optimised Lyot stop transmission $> 80\%$
- Straightforward implementation (focal mask + Lyot stop)



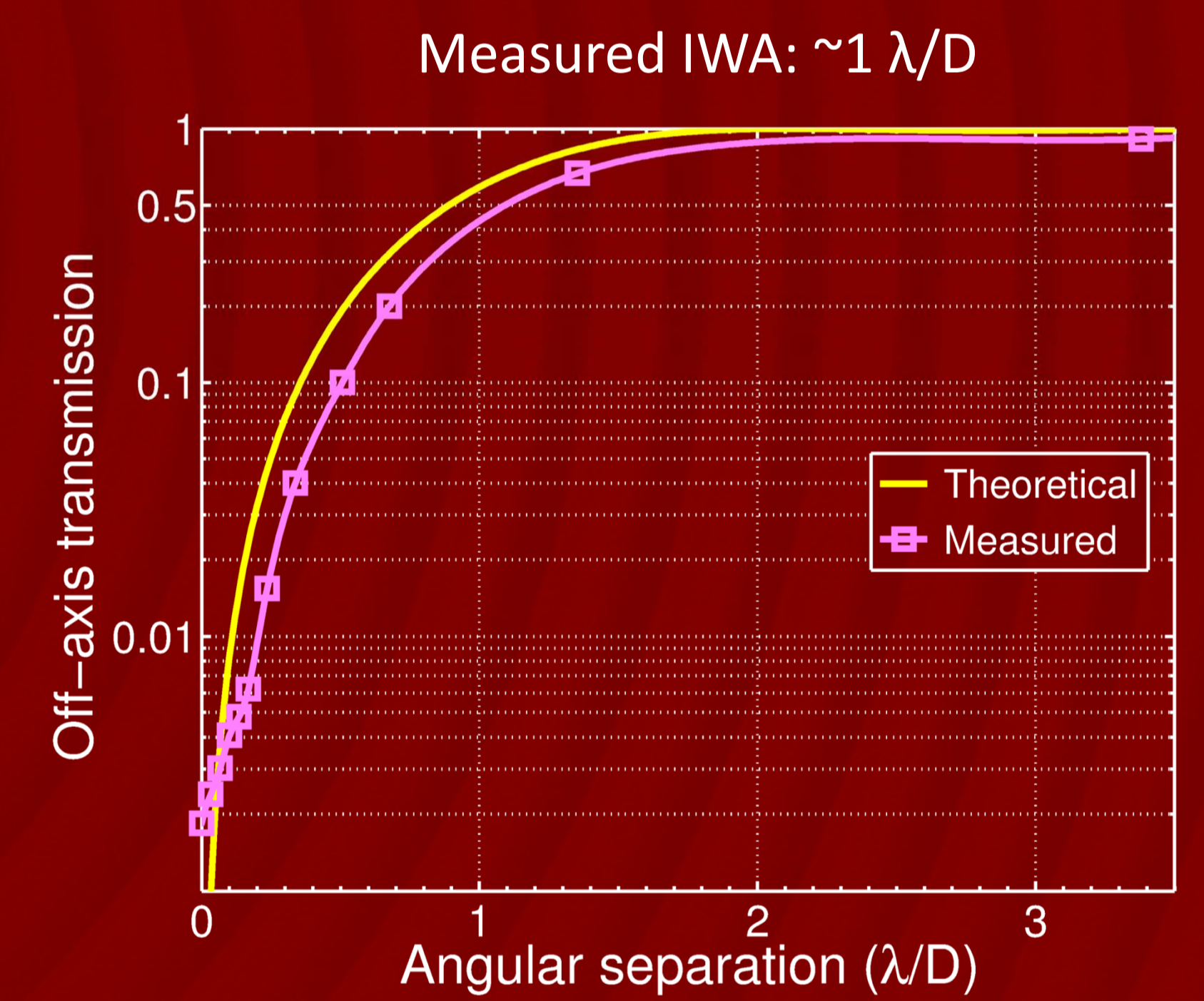
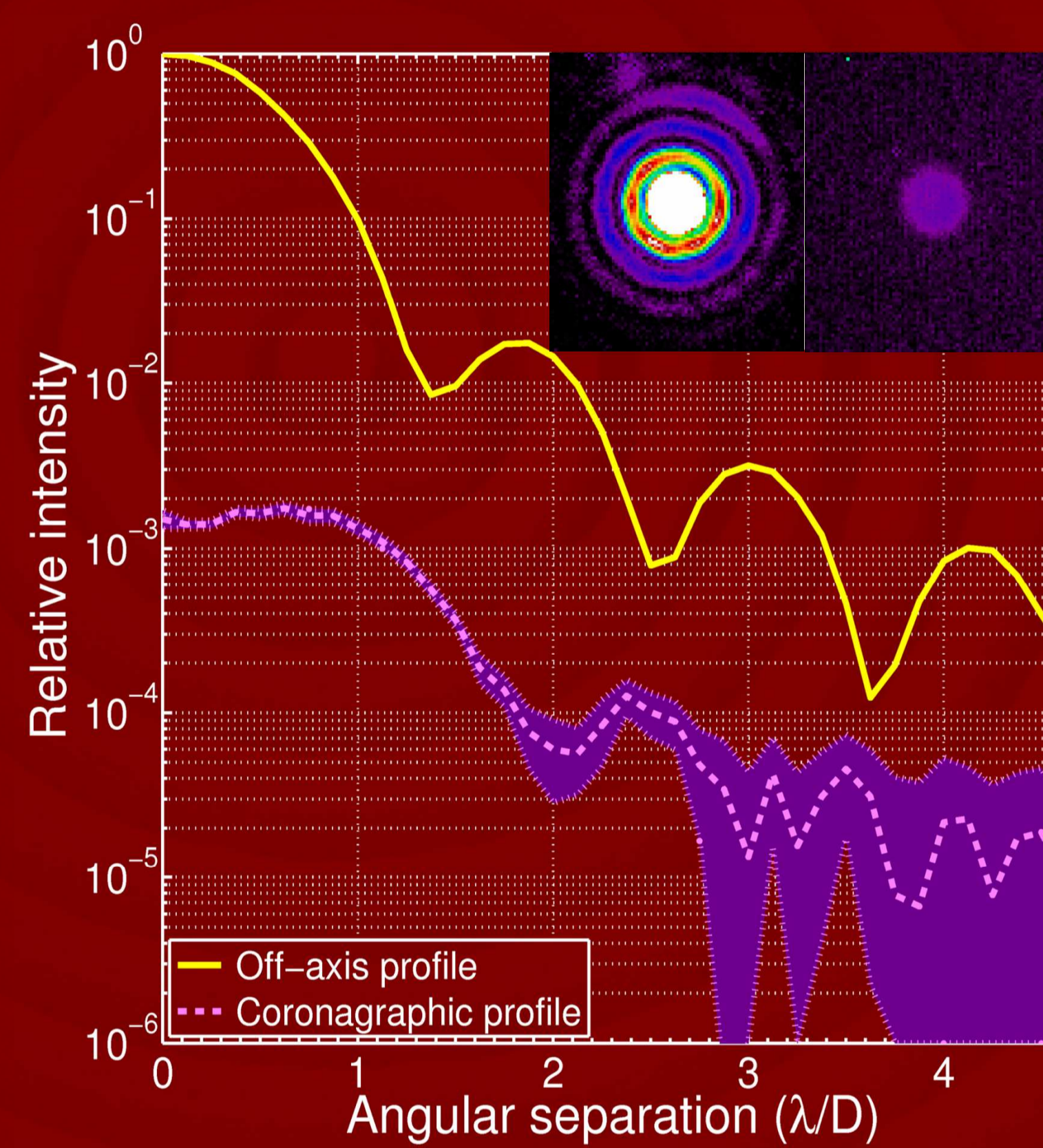
Lab demonstration @ L band

Delacroix et al. 2013 (submitted)

- Performance predicted with RCWA simulations
 - Best available AGPM-L has $\sim 500:1$ null depth on the peak
 - Ultimate performance not yet reached



- Performance evaluated on coronagraphic bench
 - Measured coronagraphic profile in agreement with predictions

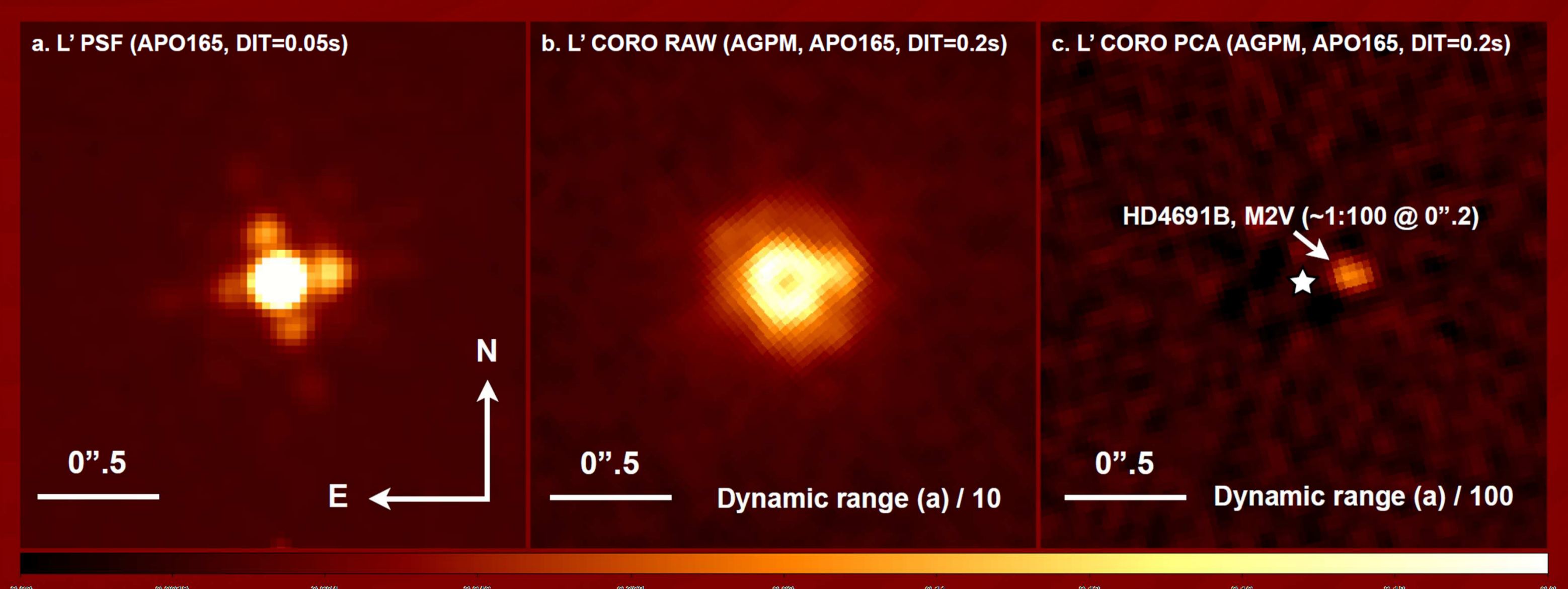


On-sky demonstration @ L and N bands

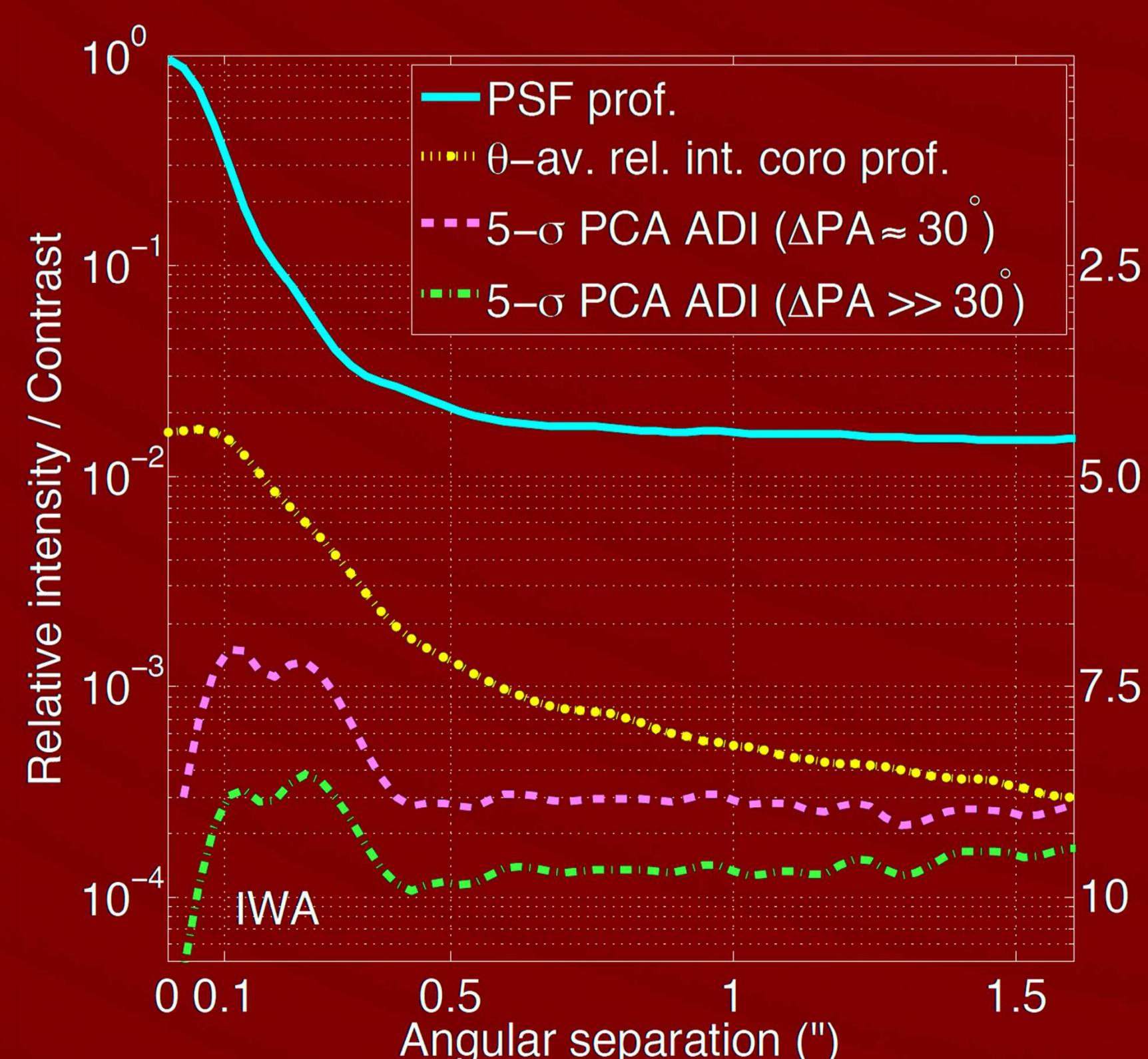
Mawet et al. 2013 (submitted)

- AGPMs recently installed on world-leading IR cameras
 - AGPM-N installed on VLT/VISIR in June 2012
 - AGPM-L3 installed on VLT/NACO in November 2012
 - AGPM-L4 installed on LBT/LMIRcam in February 2013
- 2nd generation AGPM currently developed for ELTs
 - Goal peak null depth $\sim 10,000:1$ @ L, M and N bands
 - Apodization or multi-stage vortex to mitigate central obscuration

First light on VLT/NACO



Preliminary performance on VLT/NACO



First "light" on VLT/VISIR

