An Apodizing Phase Plate Coronagraph for the VLT

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SPIE 2010 7735-109

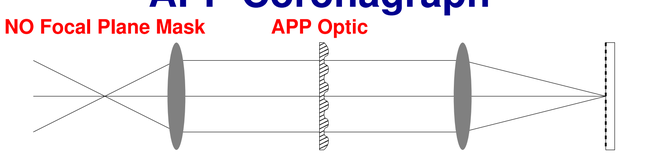
Abstract

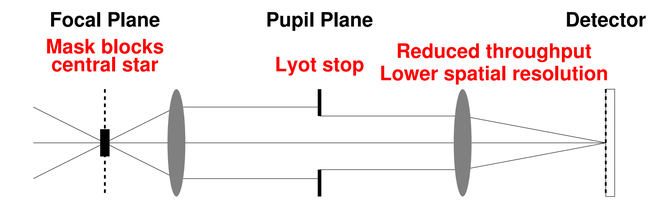
We present results from a recent commissioning run to validate the design of a coronagraphic optic for use with CONICA at the VLT that provides suppression of diffraction from 1.8 to 7λ/D at 4.05 μm, an optimal wavelength for direct imaging of cool extrasolar planets. The optic is designed to provide 10 magnitudes of contrast at 0.2 arcseconds, over a "D" shaped region in the image plane, without the need for any focal plane occulting mask.

Principle of the APP

- Suppress diffraction with light from Airy core
- No focal plane occulting mask
- High throughput of 56% for planet flux
- Insensitive to tip-tilt errors

APP Coronagraph

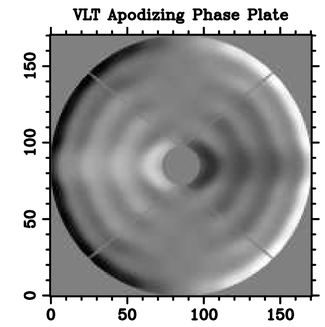


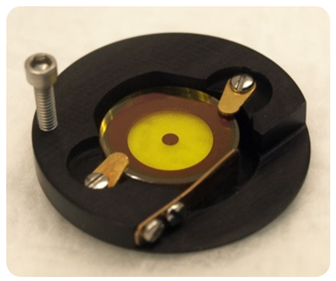


Classical Lyot Coronagraph

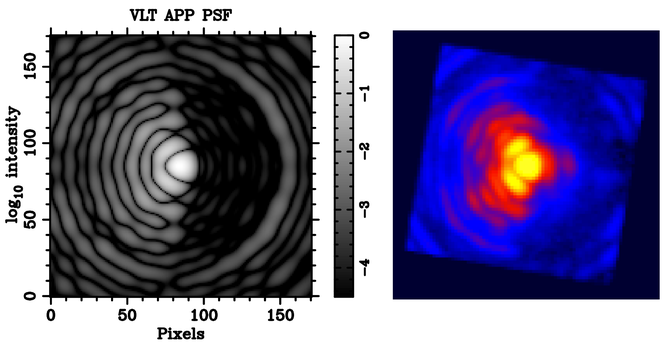
See: Codona & Angel (2004), Kenworthy et al. (2007)

Realization of APP

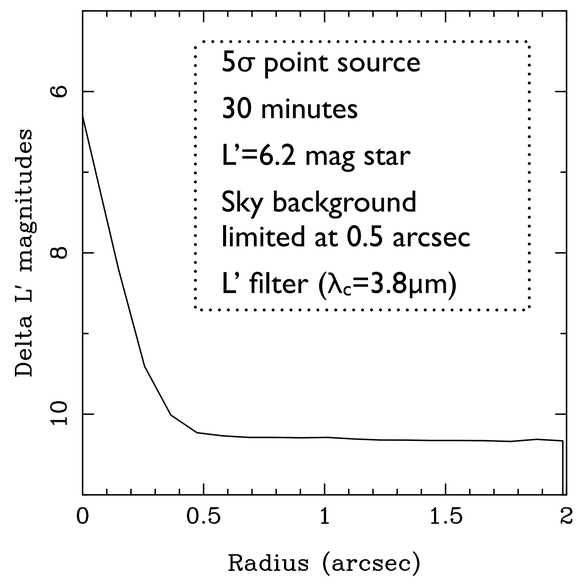


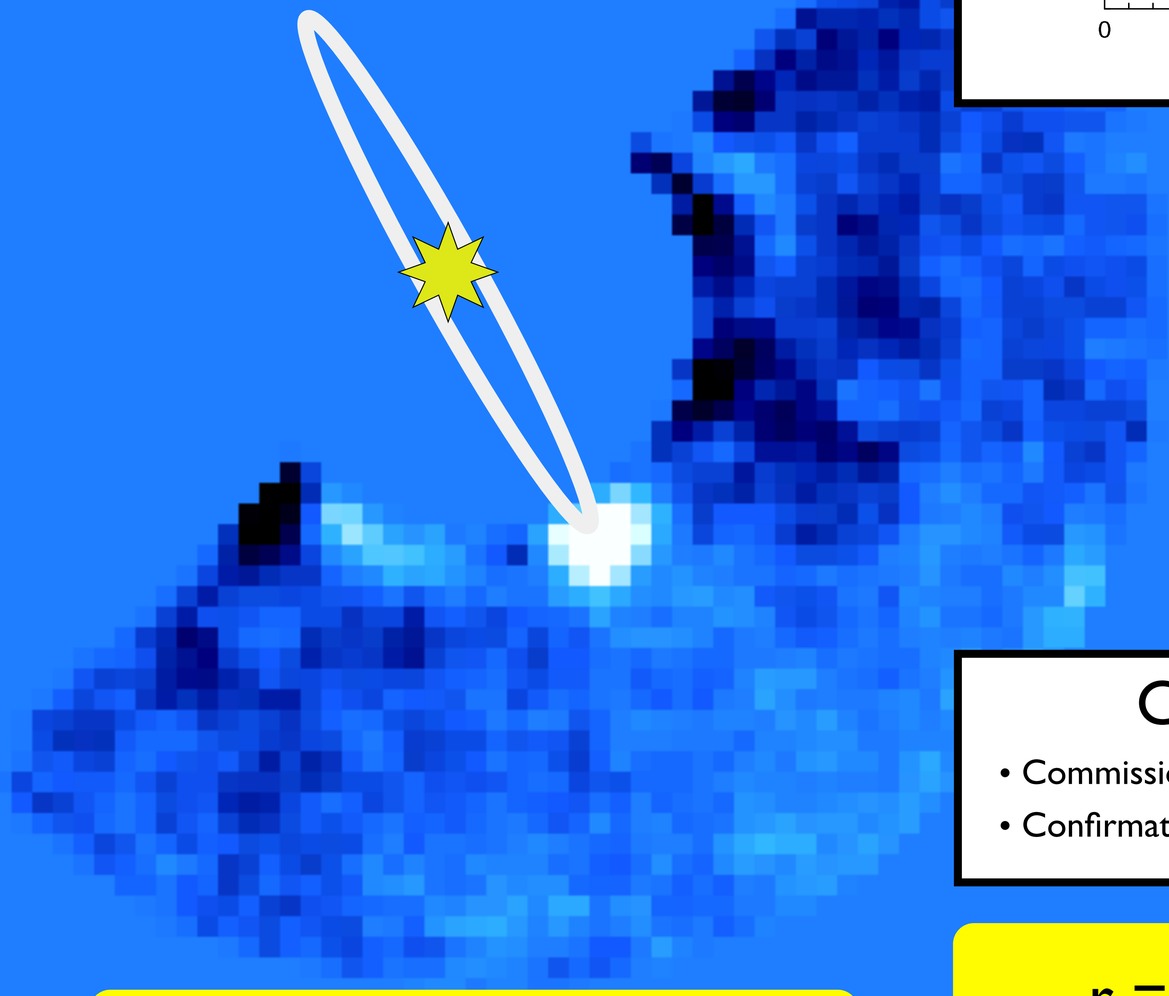


Theory — At the VLT



Measured Sensitivity





Detection of β Pic b
03 April 2010
(cf. Lagrange et al. 2010)

Current Status

- Commissioned and available at the VLT
- Confirmation of sensitivity with beta Pic

r = 0.354 ± 0.010"
P.A. = 209.13 ± 2.0°
dM [4.05] = 7.75 ± 0.23
Quanz et al. (in prep.)