

Wavefront Control for the Coronagraphic TPF

Pascal Bordé¹, Wesley Traub¹, and John Trauger²

(Email: pborde@cfa.harvard.edu)

¹Harvard-Smithsonian Center for Astrophysics, Cambridge, Massachusetts

²Jet Propulsion Laboratory, Pasadena, California

Detecting Earth-like planets with a coronagraphic telescope implies that we must attain a planet-to-star contrast ratio on the order of 10^{-10} or smaller in the visible. Even with a very high-quality optical train, speckle noise due to residual wavefront defects (both in phase and amplitude) will severely impair the planet detection. In order to decrease the speckle noise below the planet level, an active control of the wavefront is required. Wavefront sensing should be done directly with the scientific image, because a separate optical arm would introduce its own wavefront defects. To demonstrate this concept for the ECLIPSE and TPF missions, JPL has set up the High Contrast Imaging Testbed (Trauger *et al.*, 2003). This facility makes use of a band-limited image-plane mask (Kuchner and Traub, 2002) and a 32×32 deformable mirror. In this poster, we present our approach to the wavefront analysis and correction problems and give our first results.

- [a] Trauger, J., Hull, A., Backman, D., Brown, R.A., Burrows, A., Burrows, C., Ealey, M., Ftaclos, C., Heap, S., Kasdin, J., Kuchner, M., Lunine, J., Marcy, G., Sahai, R., Spergel, D., Stapelfeldt, K., Traub, W., and Woodgate, B., Eclipse: A Mission Concept for a Coronagraphic Imaging Survey of Nearby Planetary Systems, *AAS Division for Planetary Sciences 35th Meeting*, Abstr. #18.15, September 2003.
- [b] Kuchner, Marc J., and Traub, Wesley A., A Coronagraph with a Band-limited Mask for Finding Terrestrial Planets, *ApJ*, **570** (2), 900–908, 2002.

