Searching for Extrasolar Planets with Simultaneous Differential Imaging

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Simultaneous Differential Imaging (SDI) is a promising technique to provide the first-ever direct images of extrasolar giant planets, and simulations based on our measured sensitivities suggest that our newly commissioned SDI devices (operating on the MMT and VLT telescopes) should have a 10–50% chance of detecting planets around the nearest, youngest stars in our program. By using the gas giant planet models of *Burrows et al.* (2003), as well as extrapolations of extrasolar planet populations from the radial velocity survey, we are able to quantitatively determine the likelihood that a planet around any of our target stars can be detected by our technique. For a 100 Myr K-dwarf, the SDI technique is sensitive to $4M_{Jupiter}$ companions at 8 AU, or $2M_{Jupiter}$ at 30 AU. Given this precision and our simulations, we expect our current SDI surveys to begin yielding planet detections within two years, or else place very stringent constraints on the population of extrasolar planets not sampled by the radial velocity method.

[a] Burrows, A., Sudarsky, D., and Lunine, J.I., Beyond the T Dwarfs: Theoretical Spectra, Colors, and Detectability of the Coolest Brown Dwarfs, *ApJ*, **596**, 587–596, 2003.