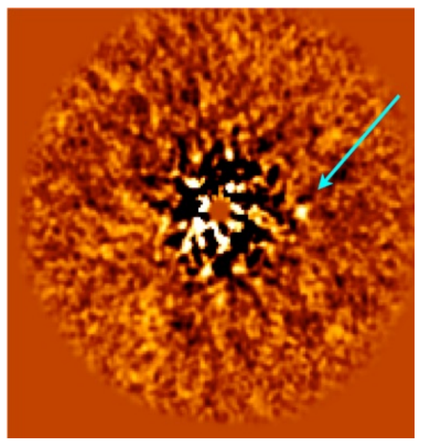
A 100-Night Exoplanet Imaging Survey at the LBT

In February 2013, the LEECH (LBTI Exozodi Exoplanet Common Hunt) survey began its 100-night campaign from the Large Binocular Telescope atop Mount Graham in Arizona. LEECH neatly complements other high-contrast planet imaging efforts by observing stars in L' band (3.8 microns) as opposed to the shorter wavelength near-infrared bands (1--2.3 microns). This part of the spectrum offers deeper mass sensitivity for intermediate age (several hundred Myr-old) systems, since their Jovian-mass planets radiate predominantly in the mid-infrared. In this poster, we present the science goals for LEECH and a preliminary contrast curve from some early data.

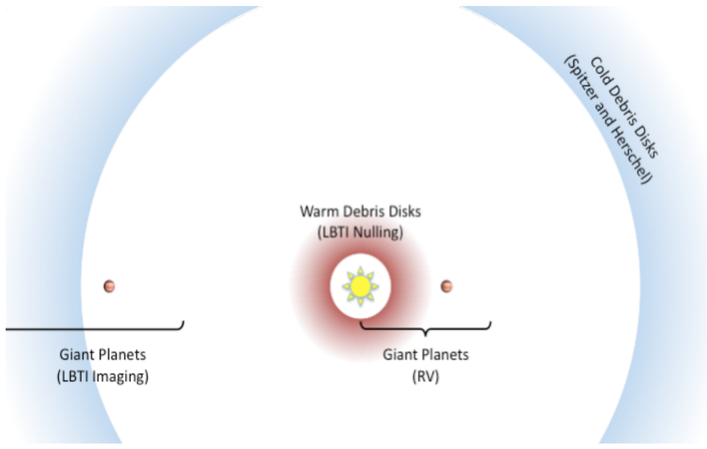
Neil Zimmerman, Andy Skemer (P.I.), Daniel Apai, Vanessa Bailey, Beth Biller Mickaël Bonnefoy, Wolfgang Brandner, Esther Buenzli, Laird Close, Justin Crepp, Denis Defrere, Silvano Desidera, Josh Eisner, Simone Esposito, Jonathan Fortney, Thomas Henning, Phil Hinz, Karl-Heinz Hofmann, Jarron Leisenring, Jared Males, Rafael Millan-Gabet, Katie Morzinski, Ilaria Pascucci, Jenny Patience, George Rieke, Dieter Schertl, Josh Schlieder, Mike Skrutskie, Kate Su, Gerd Weigelt, Chick Woodward

Discovering Adolescent Exoplanets



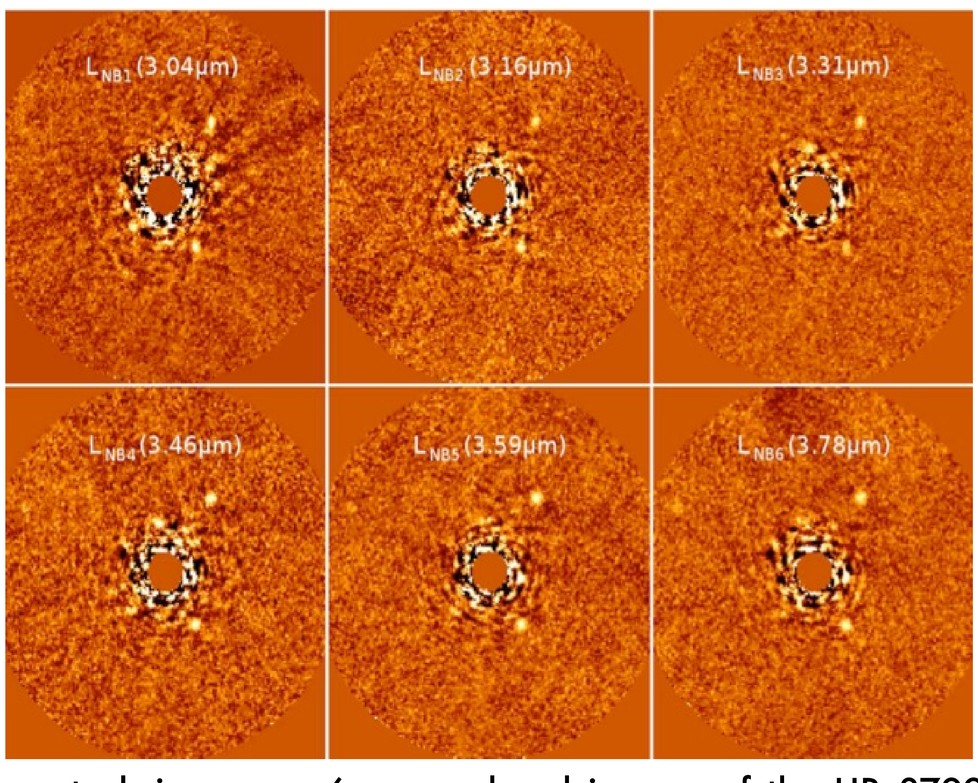
A first light image from LEECH with the star removed and a fake planet inserted. The fake planet is 13 magnitudes fainter than the star at a separation of 0.75", equivalent to a 3 Mjup planet 7.5 AU from a 0.5 Gyr solar type star at 10 pc. LEECH's ability to image older exoplanets than other surveys will extend our knowledge of exoplanet evolution.

Connecting Planets with Disks



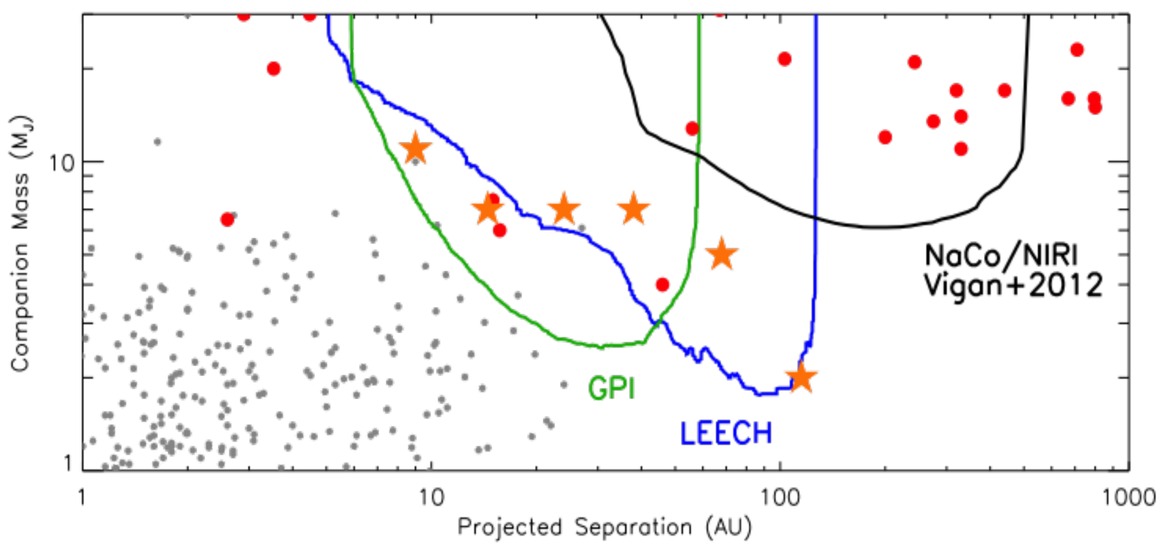
Using the two LBTI science cameras in parallel, LEECH and HOSTS will search for giant planets and inner debris disks simultaneously. The LEECH and HOSTS samples include very nearby stars that have been targeted by other relevant surveys (Doppler-RV planet searches and outer debris disk studies). Combining this data, will provide the first comprehensive view of exoplanetary systems.

Characterizing Exoplanets



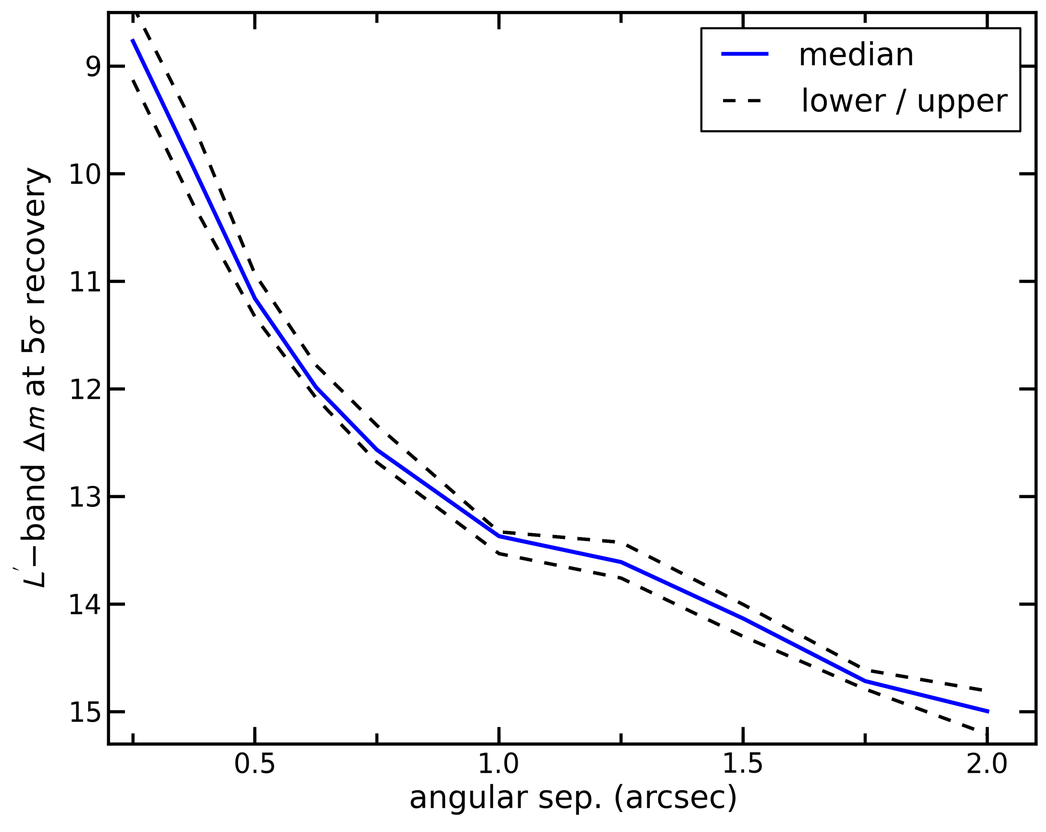
Skemer et al. in prep – 6 narrow-band images of the HR 8799 system, each of which required just 7 minutes of integration time with LBTI (dual aperture overlapped). SED work in the mid-infrared is crucial for understanding the atmospheric and bulk radiative properties of exoplanets, particularly for cool, low-mass planets that emit most of their light at these wavelengths.

Relationship with Other Surveys



Planet mass versus semi-major axis for the known exoplanets and planetary mass companions listed in www.exoplanet.eu shown in grey for radial velocity detections, red circles for imaging, and yellow stars for imaged planets around HR 8799, b Pic, and Fomalhaut. The median planet mass sensitivity for the GPI A- and F-star sample (green line), the LEECH sample (blue line), and an A-star search (Vigan, Patience et al. 2012) with NaCo/NIRI (black line) are calculated based on the Fortney et al. (2008) Hot Start model at H-band for GPI and L-band for LEECH and incorporates the individual target magnitudes, distances, and ages. Both GPI and LEECH will explore the critical missing link between radial velocity searches and current AO imaging surveys.

On-Sky Contrast Curve



ADI+KLIP detection limits for a bright star with 2 hours integration time on 1 telescope (preliminary).