Exozodi Measurements with LBTI

Phil Hinz

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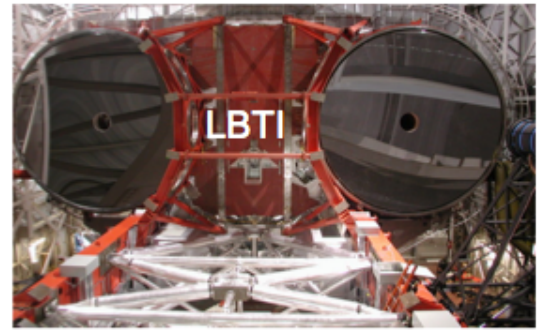
Outline:

- Why LBTI can provide good exozody measurements.
- Current test observations with MMT
- Expected LBTI performance
- LBT/LBTI status

Why LBTI can provide good exozody measurements

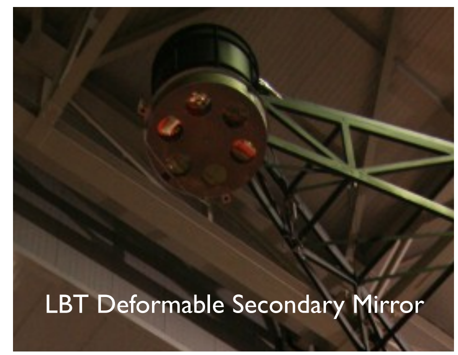
To detect dust in the habitable zone, we need:

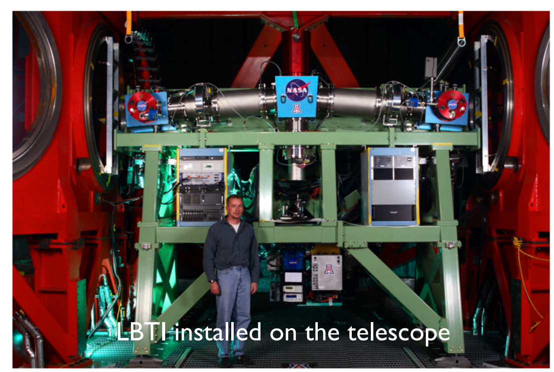
- Resolution, to distinguish resolved dust from the point-like star.
- Sensitivity, to detect faint dust disks.
- High dynamic range, to detect the faint dust in the presence of starlight.



LBTI provides:

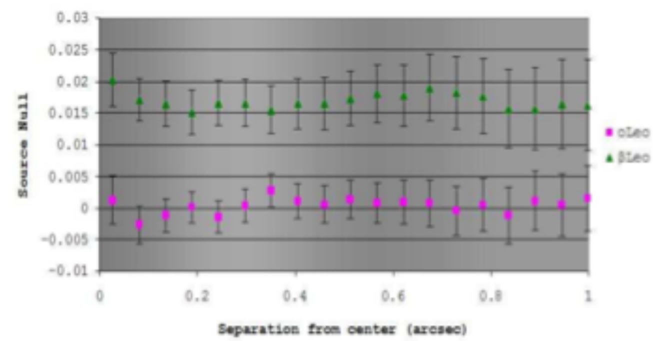
- A baseline that probes 0.7 AU scales for stars at 10 pc.
- A cryogenic beam combiner that provides low background observations at 8-13 microns wavelength.
- An integrated AO system (via deformable secondary mirrors) that provides a high Strehl wavefront for interference.
- Nulling Interferometry to suppress the starlight.


LBT Deformable Secondary Mirror


LBTI installed on the telescope

Test Observations with the MMT

- Currently achieving ~150-200 zody limit with MMT.
- Setup uses 2.5x5 m aperture on a 4 m baseline.
  - Aperture size limits sensitivity to bright stars.
  - Baseline limits usefulness to nearby stars.
  - AO performance combined with aperture size limits null depth.



Detection of a 390±70 zody dust disk around β Leo and a non-detection around o Leo with an uncertainty of 50 zodies.

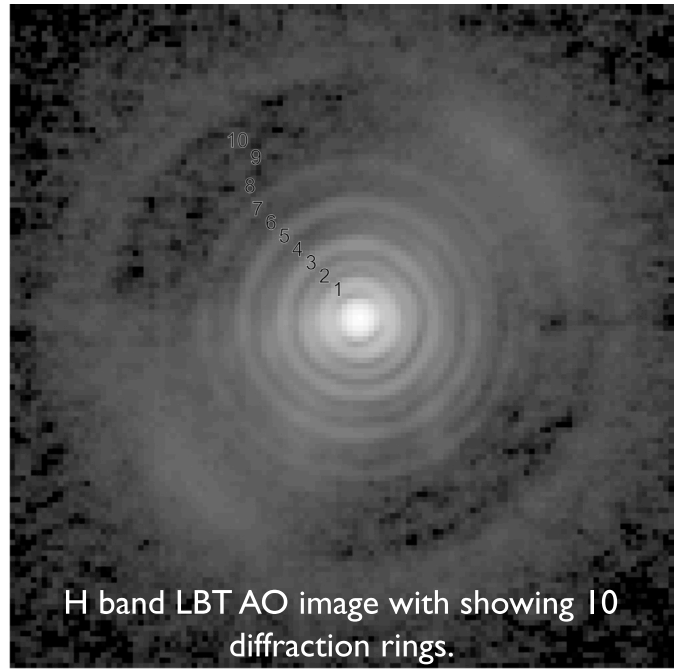
Stock et al., 2010

Expected LBTI Performance

- Measuring faint dust emission depends on careful calibration of the residual starlight in nulling interferometry.
- Main source of error is the adaptive optics residuals.
  - Residuals are spread into a size of λ/r_0, but the image is λ/D . LBTI noise is improved by 6 times for the same atmospheric conditions.
  - LBT AO system runs at twice the speed, with improved performance. Will result in a factor of 3 improvement in null uncertainty.
- LBTI will detect disks that are 10 zody and brighter, based on MMT testing.

LBT and LBTI Status

- LBT AO system #1 is being commissioned. It produced images with H band Strehl of 50-80% during its first week on-sky.
- LBTI is being installed in September 2010.
- Fall testing of LBTI will demonstrate beam combination and integration with AO #1.
- AO system #2 will be installed in Spring 2011.
- High precision nulling observations are planned for 2012.



H band LBT AO image with showing 10 diffraction rings.