A Hybrid Optical Telescope for detection of faint stellar companions and exo-planets

Dr. Douglas Hope
Georgia Tech Research Institute

Prof. Sudhakar Prasad
University of Minnesota

Profs. Stuart Jefferies and Fabien Baron
Georgia State University

Leti Garcia
Georgia State University

Megan Birch
Georgia State University and Georgia Tech Research Institute

Detecting exoplanets around host stars and characterizing the physical properties of these planets requires unprecedented high-resolution and high-contrast imaging. Achieving this using current large-aperture telescopes and optical interferometers faces several key challenges.

A new alternative to conventional interferometry and huge full apertures (>8m) is the novel hybrid optical telescope (HOT) design, which consists of phase-distributed aperture arrays. The HOT architecture follows an image-plane interferometric setup by placing apertures constructed from lightweight optics on a ring configuration. The interferometric design of HOT can leverage PSF engineering techniques that can locally create contrast levels up to levels 1e-6.

We will present numerical simulations of a HOT telescope imaging close companions to a host star and results from optical benchtop experiments on PSF engineering experiments. We will show the HOT's detection capabilities in the context of faint stellar companion detection for various wavefront control methods. Based on our analysis, we will report on potential capabilities for achieving quantum-limited super-resolution when imaging faint exoplanets near a host star.

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