



# ONE BIG EXOPLANET FAMILY: A COMPREHENSIVE ANALYSIS OF THE HD 219134 SYSTEM

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## MOTIVATION

- ★ Exoplanet parameters are directly related to their host star properties.
- ★ Directly measuring stellar parameters allows for tighter constraints on the exoplanet parameters.
- ★ The HD 219134 system: a K3V dwarf that hosts 6\* planets, two of which that are known to transit

\*Planet f's existence is considered controversial

## LONG-BASELINE OPTICAL INTERFEROMETRY (LBOI)

### What is it?

- ★ Technique that combines light from multiple telescopes separated by long distances, known as baselines (B)

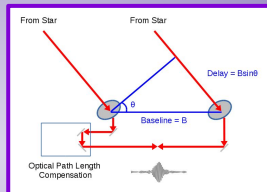


Image taken from:  
<https://chara.gsu.edu/public/basics-of-interferometry>

### Why use it?

- ★ Capable of sub-milliarcsecond angular resolution
  - Allows one to directly measure a star's angular diameter



The Center for High Angular Resolution Astronomy (CHARA) Array

## METHODS

### Stellar Parameters:

- ★ Used LBOI from the CHARA Array to directly measure the angular diameter of HD 219134
  - Developed RADPy to perform a multi-wavelength visibility squared fit
- ★ Used broadband photometry and spectrophotometry to obtain a bolometric flux with spectral energy distribution fits.
- ★ From the angular diameter, the temperature, luminosity, and radius are empirically determined.

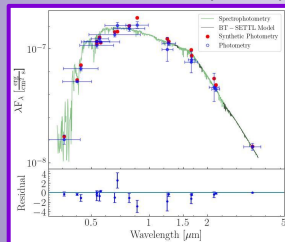
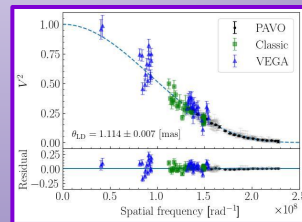


Figure 2:

Visibility squared plot for HD 219134. PAVO data are in black, Classic data are in green, and VEGA data are in blue. The model is the dashed blue line. Bottom plot shows the residuals for each beam combiner.

Figure 1:

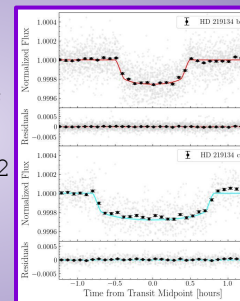
Spectral Energy Distribution of HD 219134. Broadband photometry is shown in blue. Synthetic photometry is shown in red. Spectrophotometry and BT-SETTL model is shown in green and black. Bottom plot shows the residuals.



## METHODS

### Planet Parameters:

- ★ Archival data, including ~30 years of radial velocity monitoring and 5 sectors of TESS data
- ★ Modeling with ExoFASTv2 with the precise stellar parameters as priors to simultaneously solve for an orbital solution



## IN PROGRESS

- ★ Continue modeling the system with ExoFASTv2 as a 5 planet system
- ★ Model HD 219134 as a 6 planet system with ExoFASTv2
- ★ Compare the solutions to validate planet f's existence

## ACKNOWLEDGMENTS

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