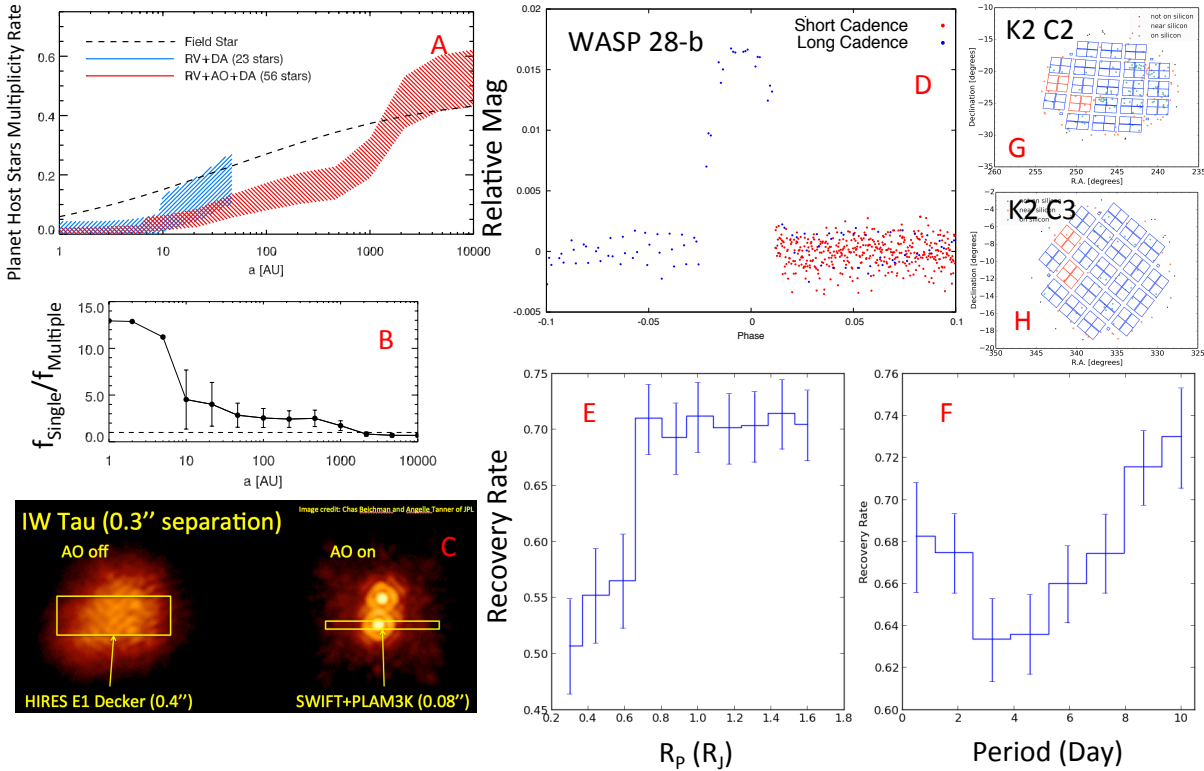


K2 Campaign 2&3 proposal: Searching For Hot Jupiters In Binary Stars
 Participants: Ji Wang (Yale), Xu Huang (Princeton), Debra Fischer (Yale)



Motivations Hot Jupiters (HJs) in binary stars serve as an important test for theories of planet formation and evolution. Disk perturbation and truncation from a binary component decrease the formation efficiency. On the other hand, Kozai perturbation of a stellar companion may be responsible for HJ inward migration. We found that planets in multiple stars ($a < 1500$ AU) are less frequent than around single stars (Fig. A and B). However, we also found that the multiplicity rate for HJ host stars is higher than field stars (not shown here), suggesting the important role of the Kozai perturbation.

Proposed Works We propose to search for HJs in binary star systems ($a < \sim 500$ AU), and measure the occurrence rate of HJs in binary stars. Binary stars in the field of view of the K2 mission are selected from the Washington Binary Stars Catalog with the following constraints: $V < 13.0$, separation $< 1.5''$, spectral type = FGKM. We will observe ~ 1500 close-in binaries over the course of the K2 mission. The numbers of targets in each K2 field are: F0=48, F1=51, F2=209 (Fig. G), F3=79 (Fig. H), F4-8=TBD. We expect to detect 1-3 HJs if the occurrence rate is similar to HJs of single stars. We will conduct follow-up radial velocity (RV) observations with the Palomar SWIFT (Fig. C), one of a few instruments that can separate close binary components and take “clean” RV data points.

Preliminary Results We now have a data pipeline to analyze the K2 data. We show here the extracted phase-folded light curve of WASP 28-b from the K2 engineer run (Fig. D). We also have an injection and recovering pipeline to study the detection efficiency of transiting signals. We have run a test on 88 close-in binaries in the Kepler main mission. The recovery rate is estimated at 50-70% (Fig. E and F).

Potential Impacts This proposal will address several fundamental questions: how frequent do gas giant planets form in binary star systems, how do HJs migrate inward? Discoveries from the K2 mission will motivate the search for planets in multiple stellar systems using AO (adaptive optics)-fed spectrograph (see Fig. C).