EXPLORING THE FUNDAMENTAL PARAMETERS OF LOW MASS STARS

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We are requesting continued 30-minute cadence observations of 99 low-mass, main-sequence, detached, double-lined, eclipsing binaries in the Kepler field. These systems were identified from both Q0/Q1 Kepler data (Coughlin et al. 2010, AJ, in press), as well as our existing Kepler GO program. The Kepler observations we request, coupled with our ongoing ground-based multi-wavelength photometric and spectroscopic follow-up data, will allow us to more accurately measure the masses and radii of these stars, and test the theory that binary spin-up is the primary cause of inflated radii in low-mass stars observed to-date. We will detect relativistic photometric beaming in 15 of the systems, and apsidal motion due to general relativity in 27 of the systems, allowing us to independently measure the stellar masses via photometry. We will also be able to probe the internal density distribution of these stars via measurement of classical apsidal motion in many of the systems. Finally, we will also measure spot, and therefore magnetic, activity as a function of spectral type and binary rotation period, and track the temporal evolution thereof. The full year of observations is needed to have a sufficient temporal baseline for the apsidal motion and spot variability measurements, as well as to build enough signal to noise for a robust detection of the relativistic beaming effect.