

HEARTBEAT STARS: A NEW CLASS OF BINARY SYSTEM WITH EXTREME PERIASTRON BRIGHTENINGS AND TIDALLY EXCITED MODES

Susan Thompson
SETI Institute
GO40056

Heartbeat stars are a new class of highly eccentric binary systems characterized by a brightening that occurs as the system passes through periastron. The varied shapes of the brightening reveal the orientation and eccentricity of the binary's orbit. Our goal is to measure the tidal evolution of these binary systems and to analyze the stellar components with asteroseismology. Such highly eccentric systems are hard to explain considering the theorized circularisation timescales of radiative stars. These systems are likely still evolving and we plan to measure their evolution by directly measuring the precession of the orbit caused by either the density distribution of the binary components or by a third body. We will also use the observed arrival time of the Heartbeat signal to constrain the presence of a possible third body. The dynamic tidal forces also induce pulsations the Heartbeat stars. Many of our systems lie in or close to the Delta Scuti instability strip. We can combine harmonically driven g-mode pulsations with intrinsic p-mode Delta Scuti pulsations to improve our mode identification and probe both the core and surface of these stars with asteroseismology. The low amplitude variations of these systems and the required timebase needed to accurately measure the pulsations and orbital evolution make Kepler the ideal instrument to accomplish our goals.