

K2 field 1 target proposal: Eclipsing Binary Stars

Kepler Eclipsing Binary Working Group

This is a continuation of the awarded proposal for K2 field 0 (GO0101, PI Prsa). The scientific objectives are similar to those for the field 0, namely:

- observations of EBs for which we already have some auxiliary data (such as colors, RVs, cluster membership, dynamics, temporal baseline), which greatly aids data mining for scientific results;
- tentative discovery of circumbinary planet transits, adding to the count exclusive to K1;
- an increasing number of EBs are found in triple and multiple systems, and featuring mass transfer and apsidal motion. In connection with asteroseismology, they are used as probes of stellar interiors by studying tidally induced and gravity-mode pulsations;
- ubiquitous overcontact binaries are still a mystery in terms of their formation and evolution, but it seems that they are all associated with multiple systems;
- intriguing unique EBs, such as ϵ Aur, VV Cep, V838 Mon, β Cep and others, provide detailed introspect into their physics;
- deriving fundamental properties of stars across the H-R diagram and finding those EBs that enable us to pursue asteroseismic studies (gravity modes, solar-like oscillations in giants, etc);
- near-continuous coverage of EBs, ranging from low-mass main sequence dwarfs to red giants, will allow us to sample an inherently different population from K1 in detail for the first time;
- the K2 photometric precision will unveil many signals that are currently buried in noise, such as low-amplitude pulsations, chromospheric activity, flares, component interaction, etc;
- stellar multiplicity of short-period EBs will be inferred from eclipse timing variations;
- building a unique synergy between K2 and *Gaia*, where we will be able to bridge sub-milliarcsec astrometry and sub-millimag photometry to obtain absolute scales and distances;
- *Kepler* EBWG has an immense experience and expertise with the *Kepler* instrument; we successfully proposed for and have access to spectroscopic instruments, we developed open-source tools that are solely devoted to *Kepler* data, and we are well poised to attain important scientific results right off the bat, providing K2 with pronounced visibility.

The target list includes objects classified as EBs in the SIMBAD database, from 45 unique VIZIER-hosted catalogs and papers, from the General Catalogue of Variable Stars (GCVS), and from SuperWASP.

The final list contains 257 unique objects that we propose for the inclusion in the K2 field 1 target list. The figure below depicts the simulated star count rate in equatorial coordinates from the Besancon model of the Galaxy and demonstrate the relatively sparse number of stars across the field. Kepler channels are overplotted, with mods 3 and 7 depicted in red.

