# Asteroseismology of Stars in Eclipsing-Binary Systems
## - Selection of Targets for K2, Fields 2 & 3 –

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*This proposal follows that submitted for field 0 (#GO0073), which was awarded one target at short cadence and three others at long cadence, and a second proposal that was submitted for field 1.*

### Scientific Context

Binary systems hosting at least one star with detectable solar-like pulsations are becoming important astrophysical targets because they provide a way to calibrate asteroseismology. As illustrated by the CoRoT and *Kepler* missions, asteroseismology is an efficient method to measure masses, radii, and ages of large numbers of stars, which is of prime importance to test stellar evolution. However, a crucial test of both asteroseismic masses and radii of a large sample of stars with independent measurements of those quantities has not yet been carried out. Eclipsing binary systems (EBs) potentially permit such an exercise by allowing for accurate determination of masses and radii of both stars by combining photometric and radial-velocity measurements, provided that spectral lines are detectable for both components. EBs are also interesting for the physical processes resulting from tidal interactions, which may influence their evolution when the stars are close enough (e.g. Gaulme et al. 2014). So far, all the published stars known to both display solar-like oscillations and belong to EBs are red-giants (RGs), and all have been detected by the Kepler mission. The first detection was the 408-day period system KIC 8410637 (Hekker et al. 2010, Frandsen et al. 2013). Since then, Gaulme et al. (2013 & 2014) reported a list of 18 *bona fide* new RG eclipsing-binary candidates of which 14 displayed oscillations. More recently, Beck et al. (2014) reported the discovery of 18 new heartbeat stars, where each system has a RG component with oscillations, and three are also EBs. Provided that oscillations are detected, observing known EBs with K2 is a unique opportunity to extend the sample of systems to test asteroseismology.

### Target Selection

We identified 26 eclipsing binaries in field 2 and 14 in field 3 from the General Catalog of Variable Stars (GCVS). By considering only systems with known spectral types and magnitudes from 8 to 12 – bright enough to detect oscillations – we end up with 2 systems in each field.

| Name | Coordinates | Binary Type | Minimum Mag | Orbital Period | Spectral type |
|---|---|---|---|---|---|
| **Field 2** | | | | | |
| V2253 Oph | 16:52:56.0 -26:45:02. | Canes Venaticorum | 8.1 | 21.5 days | K0 III |
| V1041 Sco | 16:01:51.5 -28:22:26. | Algol type | 8.94 | 2.2 days | F6V |
| **Field 3** | | | | | |
| LL Aqr | 22:34:42.1 -03:35:58. | Algol type | 9.23 | 20.3 days | G0 |
| BW Aqr | 22:23:15.9 -15:19:56. | Algol type | 10.31 | 6.7 days | F8IV+F7IV |

The three Algol-type binaries are excellent opportunities for asteroseismology of main-sequence binaries. In particular, LL Aqr and BW Aqr are accurately characterized (Southworth 2013, Imbert 1987). The *RS Canes Venaticorum* system V2253 Oph is also accurately characterized (Olah 2013) and is particularly interesting to study the effect of close binarity and surface activity on oscillation mode amplitude as observed by Gaulme et al. (2014).

From the K2FOV tool, only *BW Aqr* is **"on silicon"**, while V2253 Oph, V1041 Sco and LL Aqr are **"near silicon"**. **Short cadence** data are required for V1041 Sco, LL Aqr, and *BW Aqr* as they are main sequence binaries, whereas **long cadence** is appropriate for V2253 Oph as the primary component is a red giant.