

# Search for hot variable stars in Field 0

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We propose to observe a selection of hot blue stars with long and short cadence observations. We expect a large fraction of these stars to exhibit variability. B stars often pulsate as  $\beta$  Ceph or slowly pulsating B stars; asteroseismological estimates their age provide an independent estimate of stellar ages in clusters. The hotter O type stars are commonly found in binaries. (Sana (2012, Science, 337, 444) compute a binary fraction as high as 70%.) These O stars are prolific polluters of the cosmos with elements necessary for life, and their mass-radius relation underpins models of their evolution. We also expect to find pulsating white dwarf stars, where the cooling rate is dominated by neutrino emission and can be measured by asteroseismology (Bischoff-Kim & Østensen 2011, ApJ, 742, L16)

Batalha (2010, ApJ, 713, L109) estimated there were no more than about 250 objects hotter than 10,000 K in the prime mission field. Worse, the lack of  $u$  band photometry in the KIC made it difficult to identify very hot stars for follow up, and progress on these stars has lagged behind cooler pulsators such as the  $\delta$  Scutis and RR Lyrae. K2's Field 0, on the other hand, has partial coverage from the SDSS survey, which can be used to select hot stars.

We used SDSS  $u$ ,  $g$  and  $r$  colours to select targets to survey with K2 in Field 0. For long cadence targets, we selected all objects within the requested 12 degree radius field with  $u - g \in [0.3, 1.3]$ ,  $g - r \in [-0.6, 0.2]$ , and  $g < 15$ . This should include all stars hotter than early A. We request short cadence (SC) for the hottest objects ( $u - g \in [0.8, 0.4]$  and  $g - r \in [-0.8, 0.0]$ ). This cut captures candidate hot pulsating white dwarf stars which pulsate at periods shorter than the long cadence duration. While highly desirable, SC data is not required by this proposal.

Our list contains over 1300 objects (with 15 SC targets). Because of the non-uniform way the field was sampled by the SDSS, it is difficult to estimate what fraction will lie on silicon. We therefore rank our targets in order of decreasing priority in the attached target list, in case only a fraction of the available stars are selected by the TAC.

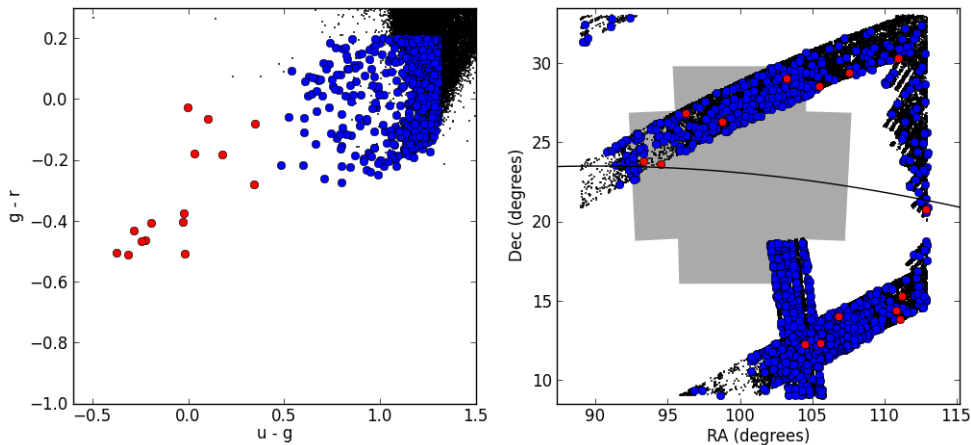


Figure 1: **Left:** Color-color diagram showing proposed long cadence targets (blue) and short cadence targets (red). The black dots are other stars in the field not proposed for. The hottest objects benefit from SC because they may be short period white dwarf pulsators with periods less than 30 minutes. **Right:** Locations of targets in ra/dec space. The solid line marks the Ecliptic, and the grey cross is the Kepler field of view projected on the sky.

