

Short Cadence RR Lyrae targets – K2 Campaigns 2 & 3

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Fields 2 and 3 contain dozens of RR Lyrae stars each. Although long cadence observations revealed a wealth of new information about RR Lyraes already, short cadence turned out to be superior in detecting time-dependent variations. Applications include the detection of low-amplitude period doubling, identification and temporal behavior of additional modes, and variations in the localized shockwave features (the hump and bump) in the light curve. Detailed observations may lead to a better understanding of mode selection mechanisms, mode interactions and various dynamical states, including chaos. The results can be used to refine the RR Lyrae distances used in the cosmic distance ladder. Here we propose 5-5 selected targets in each field for short cadence observations.

Field 2

- *V1319 Sco (EPIC 204566857)* – a relatively bright ($V \approx 11.5$ mag) RRc star. Although the ground-based survey data of the star shows definitive scatter, they are insufficient to tell whether any of the stars exhibit modulation or additional modes or both. Most RRc stars show an additional mode of unknown origin at $P/P_1 = 0.60 - 0.64$ period ratio [1].
- *M4-V76 (203372256)* and *M4-V43 (203351697)* – two RRc stars that are members of the globular cluster M4 but lie far from the core at $\sim 7R_h$ so we expect very little crowding.
- *MLS J155512.1-195855 (204979833)* – a long-period ($P = 0.696$ d) RRab star with indications of the Blazhko-effect. For reasons not yet understood, modulation is very rare among stars with periods above 0.66 days, making these targets very valuable [2].
- *MLS J155637.9-185049 (205209951)* – a star with strong Blazhko effect. Extreme modulation often displays cycle-to-cycle changes or secondary periods, and transient phenomena in the pulsation [3].

Field 3

- *CSS J220421.1-144405 (206003187)* – an RRab star with exceptionally long pulsation period ($P = 0.829$ d) that shows the Blazhko effect as well.
- *GP Aqr (206319258)* - the ASAS survey data of this RRc star show large scatter if folded with the pulsation period, indicating possible phase modulation. It can be the first modulated RRc star *Kepler* observes.
- *CSS J222825.8-170158 (205930577)* – another long-period RRab ($P = 0.731$ d) that may be modulated.
- *CSS J225158.2-094542 (206199823)* and *YZ Aqr (206144794)* – two RRab stars with strong Blazhko effect. The science cases listed for Field 2 apply for Field 3 stars as well.

Targets The brightest star among the targets is GP Aqr with a peak brightness of $Kp = 10.5$ magnitudes. All stars are included in the long cadence or globular cluster proposals too.

References:

- [1] Moskalik, 2014, IAUS, 301, 249
- [2] Smolec, 2005, AcA, 55, 59
- [3] Benkő et al, 2014, ApJS, submitted