

## Mode identification in pulsating sdB stars from ULTRACAM observations.

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**Abstract.** We present high-speed multicolour photometry for two pulsating subdwarf B stars, KPD 2109+4401 and HS 0039+4302. The pulsation properties are compared with models for evolved extended horizontal branch stars.

Jeffery et al. (2004) have presented high-speed multicolour photometry for two pulsating subdwarf B stars, KPD 2109+4401 and HS 0039+4302. Since the results have already been published in full, we present here only a brief summary of the principal conclusions.

Observations were obtained using the high-speed multi-channel photometer ULTRACAM on the 4.2m William Herschel Telescope with sampling intervals of 1s and 4s, respectively. The light curves were decomposed to give frequencies, amplitudes and phases for at least six simultaneous oscillations with an accuracy better than  $\pm 1$  mmag in amplitude.

The observations were compared with theoretical multicolour light curves for non-radially oscillating extreme horizontal branch stars using the amplitude ratio method. The radial and spherical degrees  $n, l$  of all unambiguously identified frequencies have been determined. In general  $n \leq 3$ ,  $l \leq 2$ , but both stars show one  $l = 4$  mode. The spectra of frequency versus spherical degree were compared with pulsation models for evolved extended horizontal branch stars (Charpinet et al. 2002). These confirm that KPD 2109+4401 has a post-zero-age horizontal branch age of approximately 47 Myr and an envelope mass  $\sim 0.0002M_{\odot}$ . HS 0039+4302 lies on the upper edge of the horizontal branch and hence its envelope mass and age are less well determined spectroscopically. The pulsation properties suggest that the envelope is  $\gg 0.0002M_{\odot}$  and has started to contract at the end of its horizontal-branch evolution. In both stars, the frequencies of the radial ( $l = 0$ ) modes do not match the selected models well, suggesting that the density structure or opacity in the models may be incorrect.

## References

- Charpinet, S., Fontaine, G., Brassard, P., & Dorman, B. 2002, ApJS 140, 469  
Jeffery, C.S., Dhillon, V.S., Marsh, T.R., & Ramachandran, B. 2004, MNRAS, 352, 699