SPECTROSCOPIC DETECTION OF G-MODES IN A LONG-PERIOD PULSATING SDB STAR PG 1627+017

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Abstract. We have detected low-level velocity variations due to g-mode pulsations in the long-period sdB variable PG 1627+017. The amplitudes are barely detectable at 1.0–1.5 km s^{-1}, despite the fact that this star is one of the brightest ($V = 12.9$) and largest amplitude (0.03 mag) pulsators in its class. The final radial velocity data set includes 84 hours of time-series spectroscopy over a time baseline of 53 days, with typical errors of 5–6 km s^{-1} per spectrum. Our velocities were combined with previously existing data to derive improved orbital parameters. Unexpectedly, we find that the orbit of PG 1627+017 appears slightly elliptical, supporting Edelmann et al.'s recent claim for similar ellipticities in the orbits of several other sdB stars. Our radial velocity power spectrum, after subtracting the orbital motion, shows three possible pulsational peaks at 7201.0 s (138.87 μHz), 7014.6 s (142.56 μHz) and 7037.3 s (142.10 μHz), with amplitudes only 3 to 4σ above the mean noise level. While only one of the features is statistically likely to be real, all three are tantalizingly close to, or a one day alias of, the three strongest periodicities found in the concurrent photometric campaign. We further attempted to detect pulsational variations in the Balmer line amplitudes. The only detectable periodicity, at 7209 s, is consistent with theoretical expectations as a function of wavelength, and it also allows us to rule out a degree index of l=3 or l=5 for this mode. Given the extreme weakness of the detected g-mode pulsations, we conclude that more detailed spectroscopic mode identification in long-period sdB pulsators will require larger telescopes, higher efficiency spectral monitoring over longer time baselines, improved longitude coverage, and increased radial velocity precision.

Key words: stars: EHB and post-EHB – stars: oscillations – stars: subdwarfs