

# Discovery of Spin-Modulated Circular Polarisation and Radial Velocity Variations in the Intermediate Polar 1RXS J080114.6–462324, with a possible long orbital period

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We present a comprehensive phase-resolved photometric, spectroscopic, and polarimetric analysis of the intermediate polar (IP) 1RXS J080114.6–462324, based on multi-instrument observations. These include data from the High-speed Photo-Polarimeter (HIPPO), the Southern African Large Telescope (SALT), and the SAAO 1.0-m and 1.9-m telescopes, complemented by archival photometry from the Transiting Exoplanet Survey Satellite (TESS). Notably, this system has previously been suspected to have undergone a micromnova event.

The time-resolved spectroscopy reveals prominent emission features, including strong Balmer lines, most notably H $\gamma$  and H $\beta$ , as well as He II  $\lambda$ 4686, consistent with an actively accreting magnetic cataclysmic variable. In addition, we detect redshifted absorption dips modulated on the white dwarf spin period, likely arising from infall within the magnetically channelled accretion curtains.

We report the first detection of spin-modulated circular polarisation in this system, with an amplitude of  $\sim 4\%$ , observed independently in both photopolarimetric and circular spectropolarimetric data. The absence of Zeeman splitting and cyclotron harmonics constrains the magnetic field strength to  $\lesssim 10$  MG.

We made the first detection of the periodic signal at the lowest frequency of about  $2.032\text{ d}^{-1}$ , identified in both the TESS light curve and our spectroscopy, which is most likely to be the binary orbital frequency, placing 1RXS J080114.6–462324 among the intermediate polars with the longest known orbital periods. We further confirm the presence of a previously reported signal at  $4.065\text{ d}^{-1}$ , likely to be the harmonic, and detected a coherent higher-frequency modulation at  $66.081\text{ d}^{-1}$ , with no evidence of a beat frequency.

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