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Emission constraints for the white dwarf pulsar via modelling of its phase-resolved polarisation signatures

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Marsh et al. (2016) detected radio and optical pulsations from the binary system AR Scorpii (AR Sco). This system, with an orbital period of 3.55h, is composed of a cool, low-mass star and a white dwarf with a spin period of 1.95min. X-ray pulsations have also been detected from this source (Takata et al. 2018). Optical observations by Buckley et al. (2017) showed that the polarimetric emission from the white dwarf is strongly linearly polarised (up to ˜ 40%) with periodically changing intensities. This periodic emission is thought to be powered by the highly magnetised (5*10ˆ8 G) white dwarf that is spinning down. We fitted a standard rotating vector model to these polarisation emission angle data, and found a magnetic inclination angle (α˜90 °) and an observer angle (ζ˜60 °). Using zeta and the mass function from Marsh et al. (2016) we could constrain the mass of the white dwarf to M_{WD} = 1.00 ± 0.19. We next applied our model to the orbitally phase-resolved polarisation position angle data from Potter and Buckley (2018b) to find α and ζ vs. orbital phase. We will present our first results to indicate the evolution of α and ζ vs. orbital phase, thereby constraining the spatial origin of the emission.

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Yes

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MSc

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