HEASA2023

Towards Modelling AR Sco: Particle Dynamics and Calibration

Contributed Talk //

Pulsars and Pulsar Wind Nebulae (PWNs)

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North-West University (NWU)

Session 4 //

Wednesday, 6 September @ 16:30 SAST

AR Sco is a close binary system that contains both a white and red dwarf. The spin rate of the white dwarf has been observed to slow down with time, analogous to rotation-powered radio pulsars; it has thus been dubbed a ”white dwarf pulsar”. With the emergence of the AR Sco sibling source recently, modelling these sources and understanding their evolution has become important. We have constructed a generalised emission model, solving the particle dynamics from first principles, including a generalised radiation-reaction force, and implementing similar techniques to what were used in a pulsar emission code developed by A.K. Harding and collaborators to produce emission maps, light curves and spectra. Additionally, our model is able to probe non-relativistic motion and is thus ideal for magnetic mirror scenarios.

We will present our improved particle dynamics results when including E-fields in test scenarios. We will also illustrate our reproduction of the magnetic mirror scenario results of Takata et al. (2017). We will also present calibration results between our new code and that of Harding and collaborators used to produce emission maps, spectra, and light curves of pulsars. Upon full calibration, we can confidently generate such outputs for AR Sco for much lower Lorentz factors and more generic particle motions.

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