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Orbitally Modulated High-Energy Emission from Black Widows and Redbacks

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Searches of unidentified Fermi sources have vastly expanded the number of known galactic-field "black widow"and "redback"circular MSP binary systems. We model the high-energy emission from these systems due to relativistic leptons in the pulsar wind and those accelerated in intrabinary shocks. We show that the observed radio eclipses of the MSP can constrain the shock and system geometry. We also reproduce characteristic double-peaked orbitally modulated X-ray emission observed in many MSP binaries through Doppler boosting along the intrabinary shock. Redbacks and transitional pulsar systems, where the double-peaked X-ray light curve is observed at inferior conjunction, are suggested to be intrinsically different in shock geometry than other MSP binaries. Inverse Compton emission as a function of energy and orbital phase, from electrons in the pulsar wind or intrabinary shock scattering UV photons from the irradiated companion, is explored. The anticipated modulation of high-energy emission at the binary orbital period presents a unique astrophysical probe of the unknown physics of pulsar winds, relativistic shock acceleration and transport. Implications for Fermi-LAT and CTA target selection and searches are discussed.

Primary author: Dr WADIASINGH, Zorawar (Centre for Space Research, North-West University)

Co-authors: Dr HARDING, Alice (NASA GSFC); VENTER, Christo (North-West University Potchefstroom Campus); BOETTCHER, Markus (North-West University)

Presenter: Dr WADIASINGH, Zorawar (Centre for Space Research, North-West University)

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