

Gamma-ray Eclipses from Redback and Black Widow Pulsars

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The ability of the Fermi Large Area Telescope to identify pulsar-like gamma-ray sources has sparked a huge increase in discoveries of “Spider” millisecond pulsar binaries (Black Widows and Redbacks). These systems are characterised by long radio eclipses due to scattering and absorption by diffuse intra-binary material that has been evaporated from the companion star’s surface. Unlike radio emission, gamma-ray pulsations cannot be absorbed or scattered by this diffuse intra-binary material, and therefore the presence of a gamma-ray eclipse provides conclusive evidence that the pulsar passes directly behind the companion star. These subtle gamma-ray eclipses are only just becoming detectable thanks to the duration of the Fermi mission. I will present the results of our searches for gamma-ray eclipses from Spider MSPs, including the discovery of significant gamma-ray eclipses from several systems. I will describe how the detection, or significant exclusion, of a gamma-ray eclipse provides a crucial independent diagnostic for pulsar emission models and Spider optical light curve models, and how the new constraints on Spider binary inclination angles lead to robust constraints on their otherwise elusive pulsar masses.

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