

Title

**Revealing a new binary eclipsing millisecond pulsar population in the Galactic bulge**

Abstract

Astronomers have recently discovered 7 candidate eclipsing binary pulsar (PSR) systems via image-plane searches for steep-spectrum radio sources with periodic variability. All candidates are either in or close to gamma-ray source error ellipses. The radio emission and short eclipse periods (<24 hrs) suggest PSRs in close binary orbits with main sequence stars, ablating their material. Together with the gamma-ray emission, these candidates appear to be accreting, spider PSRs evolving towards millisecond pulsars (MSPs). Discovery of MSPs in these systems would provide key insights into the earliest stages of recycled pulsars and the Galactic evolution of MSPs. This would also improve predictions of the eclipsing binary pulsar and MSP populations detectable by upcoming, highly sensitive image-plane surveys using precursors of and the Square Kilometre Array (SKA) itself. Finally, 6 of our 7 candidates are also located in the Galactic bulge, where only two such systems are currently known. If these systems include MSPs or their precursors, it would provide further compelling evidence that the Fermi GeV gamma-ray excess (GRE) comprises emission from thousands of MSPs, as opposed to a proposed dark matter origin for such an excess. This proposal supports a PhD project exploring transients on -minute to hour-timescales in image-plane radio surveys taken with SKA precursors, running from 2023 to 2025.