

Plucking the Web: Searching Unassociated Fermi Gamma-ray Sources for Spider Pulsars with a Jerk search Algorithm

Tuesday, 13 April 2021 18:00 (5 minutes)

In the past decade, the most successful approach to search for millisecond pulsars (MSPs) has been to use acceleration searches to look for radio pulsations in the error bars of Gamma-ray sources identified by the Large Area Telescope (LAT) aboard the Fermi Satellite. However, 1000s of gamma-ray sources found by LAT still remain unassociated with any astrophysical object. It is believed that many of these could be MSPs. One of the reasons for their non-detection is that the present method of doing acceleration searches to account for the orbital motion of the pulsar is only effective when the observation time is less than 1/10th of the orbital period. We have been using the novel jerk search algorithm implemented in the PRESTO software package to re-search Fermi sources that remain unidentified. Jerk search is sensitive to changes in the period of the pulsed signal up to its second derivative caused by the orbital motion, resulting in increased sensitivity to tight binary systems. We are using radio data gathered from the Robert C. Byrd Green Bank Telescope (GBT) at 820 MHz for unassociated sources from Fermi LAT catalogs as part of the Fermi Pulsar Search Consortium. Here we present the Discovery of 11 MSPs as a result of such a search, one of which has been confirmed as a black-widow. There's also a MSP which has companion more massive than expected through evolutionary models. Another of these has already been confirmed as an isolated gamma-ray MSP.

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Session Classification: Binaries/Galactic/Pulsars/SNR/Solar-1

Track Classification: Pulsar