

Studying the southerly eclipsing millisecond pulsar J1748–2446A using MeerKAT

Wednesday 2 October 2024 17:40 (20 minutes)

In this discussion we will be focusing on the changes of the dispersion measure (DM), rotation measure (RM) and scattering characteristics of PSR J1748-2446A. PSR J1748-2446A is a “spider” binary in Terzan 5 where the pulsar blasts the surface of its orbiting companion star away. We used data from the MeerKAT telescope at L-band frequencies to look at the complex eclipse of this spider binary. Our observations of PSR J1748-2446A revealed that its radio emissions experienced an increase in DM as it moved into and out of eclipse phases. We also observed a change in the rotation measure up to tenfold compared to the initial RM value. We noted distinctive pulse widening, which can be attributed to multi-path propagation effects in the signal, and for the first time for this pulsar, we quantified the scattering time. Because measured the changes in DM and RM, we estimated the magnetic field strength of the companion’s material to be an order of magnitude greater than that of the Crab Nebula. We have also estimated RM values deep into the eclipse to be about 20 times the initial value. Our findings inform us that the companion material is an ionised and turbulent magnetised plasma, with electron densities and density variations much higher than the typical interstellar medium.

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Session Classification: Poster Session

Track Classification: Pulsars and Pulsar Wind Nebulae