

A MeerKAT legacy timing and imaging study of PSR B1259-63 at periastron

Abstract

Gamma-ray binaries where a compact object orbits a massive star in a highly eccentric orbit make for excellent test beds to study the most extreme physics, as well as binary and stellar evolution. In spite of detailed studies of these systems, several fundamental questions about the structure of the stellar wind from the massive companions and their effect on the emission from the compact object remain unanswered. Recent observations have shown that these effects can be relevant to explain the observational characteristics of fast radio bursts; luminous radio flashes of as yet unknown origin. With this in mind, we propose a MeerKAT monitoring campaign of a well-known gamma-ray binary system as the radio neutron star goes through the periastron. Using the unique capabilities of simultaneous timing and imaging of MeerKAT, using 10 hours divided over 18 observations will allow us to get an unprecedented view of the system through its various orbital phases. The campaign will thereby provide answers to a trio of fundamental questions, regarding the structure and creation of massive star winds, the physics of intra-binary shocks, and propagation effects on FRBs. The latter will directly constrain the types of systems FRBs originate from.