

Characterising recent MeerKAT isolated pulsar discoveries

Abstract

Neutron stars have a wide range of observational properties and individual pulsars, in particular, can be unusual and therefore interesting. Several populations with overlapping properties, including nulling pulsars, magnetars, recycled pulsars and mode-changing pulsars exist. Despite a large number of pulsar discoveries, many open questions exist. Pulsar emission mechanisms, birth properties and how these distinct populations are related to each other (i.e. evolutionary trends) are not well understood. By piecing together information on the current observable population of pulsars, we will be able to hypothesize possible answers to these fundamental questions.

78 pulsars along the Galactic plane have been recently discovered with the MeerKAT telescope, 61 of which are isolated including high dispersion measures (DMs, representing the column density of free electrons along the line of sight), nulling and possible mode changing pulsars. This sample has the potential to cover multiple science cases and understanding the properties of this sample is necessary to identify interesting systems. In this proposal, we request ~70 hours to observe these isolated pulsars to estimate their rate of spin-down, obtain their spectral indices, and analyse their polarization profiles. In doing so, we can study a different region/depth of the interstellar medium (ISM), DM and the Galactic magnetic field and place constraints on pulsar formation mechanisms, evolutionary mechanisms, the ISM and the Galactic magnetic field.