

Unveiling a population of evolved massive stars with MeerKAT

Abstract

The recent MeerKAT L-band Galactic Plane Survey has revealed dozens of extended structures linked to known evolved stars, including many Planetary Nebulae, Luminous Blue Variables stars and Wolf Rayet stars. However, a substantial fraction of extended sources detected in the survey remains unclassified. After a thorough inspection of the survey tiles, we have identified more than 40 low-angular diameter, low-surface brightness shells with no matching entries in literature catalogues of known evolved objects. We suspect that these new detections, displaying features consistent with typical LBV and WR radio nebulae, may be tracing a hidden population of evolved massive stars. This proposal aims at investigating 10 of these shells using MeerKAT S-band, with the goal of: 1) achieving a better morphological characterization of the shells, disentangling the clumpy rings from the emission of the central point source (when present) ; and 2) studying their spectral behaviour by computing their spectral indices between the L- and S-bands. This analysis allows for discriminating sources where the shell emission is predominantly thermal (e.g. free-free from ionised gas, as expected in PNe and massive evolved stars) from sources where non-thermal processes dominate (e.g. shocked nebulae). As a pilot program, this project will highlight the potential of MeerKAT as a powerful discovery and characterization tool in the search for the "missing" evolved stars in the Galaxy.