

A MeerKAT look at radio-detected runaway stellar bow shocks

Abstract

Massive stars moving with supersonic velocities in the ISM create bow shocks that can accelerate charged particles to TeV energies and beyond. Through their radio synchrotron emission, the presence and energetics of such particles can be measured, allowing for calculations of their very-high energy emission. While for a decade, only a single radio synchrotron counterpart of a bow shock was known, recent observations with ASKAP revealed nine new (candidate) radio counterparts. As the nature of their radio emission remains unclear, we propose UHF + L-band MeerKAT observations of these targets, for a total observing time of 10h 40min. These observations will (i) confirm which candidates are real radio counterparts of the bow shocks, (ii) trace the morphology of the shocks, and (iii) distinguish between a free-free and synchrotron origin of the emission via spectral index measurements. In the synchrotron scenario, those spectral index maps will be used for detailed modelling of the particle acceleration. In addition, the observations cover two star-forming regions, allowing for studies of the mass-loss rates and binarity of their massive stars.