

Resolving Ultra-Diffuse Galaxies in HI

Abstract

We request 17 hours of MeerKAT 32K mode observations to image and resolve the HI distributions of two gas-rich ultra-diffuse galaxies (UDGs). The properties of most UDGs are commensurate with dwarf galaxies, but some have dynamical masses similar to the Milky Way with 1-10% of the stars. While several formation mechanisms have been proposed, the origin of these peculiar objects, particularly gas-rich, blue UDGs in low-density (i.e. field) environments, remains unclear. Efforts have been made to constrain formation scenarios for these objects using both single-dish and interferometric HI observations. Interestingly, recent work using marginally resolved HI imaging suggests that their rotation velocities are lower than expected from the nearby galaxy Baryonic Tully-Fisher Relation (BTFR), implying that they are dark matter-free within their baryonic disks. However, this finding is muddled by the low spatial resolution of the HI observations, which required a novel technique to disentangle their rotation velocities from their inclinations. Understanding the kinematics of UDGs is essential in understanding their origin and evolution. The combination of its exquisite surface brightness sensitivity and high spatial resolution makes MeerKAT the ideal telescope to image gas-rich UDGs at higher angular resolution and apply standard, well-tested tilted-ring kinematic models to the final HI datacubes. The modest amount of observing time requested in this proposal will have the potential to illuminate whether UDGs are truly rotating more slowly than expected and demonstrate the capabilities of MeerKAT in this regime.