Title

Solving the puzzle of Superthin galaxies: star formation, dark matter and environment

Abstract

We propose to map the HI atomic gas in a complete sample of 18 nearby massive superthin galaxies. Superthin galaxies are spiral galaxies that exhibit extraordinarily large disk axial ratios (>10) and little to no discernible bulge component. The formation of such objects in the hierarchical LamdaCDM context is not well understood, and these observations will allow us to confirm or refute the leading theory to explain their properties. We will dynamically determine the shape of the dark matter halo profile of these objects, which are expected to be extremely dark matter-dominated. We already have access to high-resolution ALMA CO(1-0) data for all 18 sample galaxies, probing the potential in the inner regions of these superthins. We will combine this data with deep MeerKAT HI observations, at L-band, to gain a complete picture of the galaxies' kinematics on much larger physical scales. This will allow us to determine if these objects remain stable against bulge formation due to living in the most extreme dark matter halos, and probe their environments by searching for warps and disturbances in HI. Furthermore will be able to determine what is reducing the efficiency of star formation in such systems, which have somehow retained their gas and low surface brightness stellar discs for a Hubble time. A short investment of 66 hours of MeerKAT time will allow us to probe the impact of galaxy structure on star formation, and reveal the dark matter halo properties and environments of these enigmatic objects.