MKT-23157

The Starburst Galaxy ESO338-IG004: A Rosetta Stone for Studying Lyman-alpha Radiative Transport

Abstract

The Lyman-alpha line is a critical tool to study the high-redshift Universe, but its propagation through the ISM is theoretically strongly affected by HI kinematics. Static neutral gas will aide resonant scattering and absorption of Lyman-alpha photons by dust, while outflowing neutral gas favors the escape of Lyman-alpha photons. The starburst galaxy ESO338-IG004 is an ideal laboratory in which to study this complex physics in detail. This nearby (D = 37.5 Mpc) system is undergoing a dramatic merger with a nearby companion galaxy that has strewn HI gas over tens of kpc, and its high star formation rate sustains an enormous, density-bounded ionized gas halo. A wealth of HST UV spectra provide details on the Lyman-alpha profiles in a dozen locations throughout the system, enabling a spatially resolved investigation of Lyman-alpha radiative transport. Further, deep MUSE data probe the gas in the ionized halo, constraining the leakage of ionizing photons and the properties of the galactic wind. The superb sensitivity of MeerKAT will allow us to map the HI in this complicated merging system in unprecedented detail. The science goals are to measure the HI kinematics on the same sightlines along which the Lyman-alpha profiles have been measured by HST, to map the low column density diffuse HI gas, and to undertake a detailed comparison of the spatially resolved HI gas with the ionized gas and stellar components. The proposed MeerKAT HI observations will provide the foremost interpretive benchmark for understanding the physics of Lyman-alpha radiative transport within galaxies.