Title

MeerKAT confirmation of rich gas content of extremely metal-poor galaxies

Abstract

Local extremely metal-poor galaxies (EMPGs) are galaxies in the lowest metallicity regime and thus low-redshift analogs of high-redshift galaxies at an early stage of evolution. EMPGs are expected to be gas-rich galaxies with gas mass fractions of 90%. Only the combination of MeerKAT and MUSE (an optical IFU) makes it possible to reveal the interplay between the cold neutral and warm ionized phases (traced by 21cm and H-alpha, respectively) and provide a complete view of the mass budgets of these primordial galaxies for the first time, which is essential for understanding the physical processes governing galaxy evolution. Therefore, we propose HI 21 cm observations with MeerKAT (imaging with L-band and 32K wide channels) for 38.6-hour integrations (on-source for 30.9 hours) for three EMPGs at z=0 with <~ 5% solar metallicities, whose ionized gas is observed with MUSE. We will 1) directly determine the HI gas mass and gas mass fractions, and 2) derive mass budgets explaining dynamical mass (stellar, ionized gas, neutral gas, and dark matter) and discuss whether these EMPGs are dark-matter deficit galaxies, whose existence has been debated. We aim for a 1sigma HI column-density limit of sigma(NHI)=1e20/cm2 at a 7" resolution. Our EMPGs will be unique laboratories to test models of galaxy evolution and cosmic reionization, and this project will uniquely broaden the scientific horizon of MeerKAT.