

Title

Studying the baryonic content of galaxies near cosmic noon using MeerKAT

Abstract

MeerKAT and the upcoming SKA will drastically increase our horizon for direct measurements of neutral hydrogen (HI) in the Universe providing new insights on the baryonic content of galaxies across cosmic times. Using the powerful MeerKAT array and 21 cm stacking techniques, we propose to measure the HI mass of a sample of 74 star-forming main sequence (MS) galaxies at $z=0.8-1.5$ in the COSMOS field, for which the molecular gas (H₂) mass was measured by ALMA. Simultaneously, our observations will also determine the HI mass of large samples of COSMOS MS galaxies at the same z and at $z=0.4-0.8$. The measurements will yield the average HI gas mass fraction (f_{HI}) of these high- z samples through stacking analysis. For the H₂-detected galaxies this will provide, for the first time, a complete census of the baryonic gas (HI+H₂) at high z . We will also get an independent measurement of f_{HI} , obtained earlier with the GMRT, with another telescope and in another field with the full sample of COSMOS MS galaxies at $z=0.8-1.5$. Our HI stack results both at $z=0.8-1.5$ and $z=0.4-0.8$ in combination with the MIGHTEE-HI survey will yield the first observational constraint on the f_{HI} evolution from $z=0$ to $z\sim 1.5$ in the COSMOS field. This will allow us to make a direct comparison with cosmological halo mass models. The proposed observations optimally exploit the unique capacities of MeerKAT to provide important new insights on the baryon content of galaxies at cosmic noon.