

Searching for HI in distant galaxies with LADUMA

Supervisor: Dr Jacinta Delhaize. Email: drjdelhaize@gmail.com

Background:

Galaxy evolution studies require knowledge of the neutral hydrogen gas (HI) content of galaxies at different cosmic epochs. However, the 21cm atomic transition line of HI has been difficult to detect out to high redshift. One of the large survey projects being conducted by the MeerKAT telescope is 'Looking at the Distant Universe with the MeerKAT Array' (LADUMA) which aims to detect HI sources out to high redshift.

One of the very first challenges is to find these HI sources in the data. There are several different ways to do this, including manually looking through the data cube. However, this is time consuming and there is a large chance of missing galaxies.

In this Masters project, the student will be trying to find HI sources in the LADUMA data using an automated program called SoFiA: the Source Finding Algorithm. SoFiA is very powerful and fast but can be difficult to adapt to a new data set.

The student will:

- Determine the best SoFiA parameters to use and provide a recommendation to the LADUMA team.
- Verify SoFiA detections by comparing with potential HI sources identified via other means.
- Verify all HI detections by comparing with optical/multiwavelength data, ideally using the SoFiA-image-pipeline.
- Determine important physical parameters of the detected galaxies, such as HI mass. Establish an initial LADUMA source catalogue.
- Determine the completeness and reliability of the LADUMA source catalogue by comparing with source finding over simulated cubes.

Skills required:

- Basic python programming experience. Familiarity with Jupyter Notebooks would be advantageous.
- Basic level of familiarity with terminal commands
- Some familiarity with SoFiA and/or CARTA is beneficial, though not required