Project title: MeerKAT studies of the HI content of AGN
Type: MSc
Institute: UCT
Primary Supervisor: Dr Jacinta Delhaize (UCT); jacinta@ast.uct.ac.za
Co-Supervisor: TBD

1. Project description

Two important components of galaxies, which are thought to play important roles in their evolution, are the neutral hydrogen gas (HI) content and active galactic nuclei (AGN) activity. Yet very little is known about the relationship and interplay between these components. Studies of the neutral hydrogen content of AGN have, until now, been nearly impossible due to the lack of sensitivity of available HI data. However, thanks to the excellent sensitivity of South Africa's MeerKAT telescope, we are now entering a realm where we will be able to more directly examine the influence of AGN feedback on the gas contents of galaxies. This project will take advantage of the revolutionary HI and radio continuum observation powers of MeerKAT to understand the interplay between gas, star formation and the AGN duty cycle over cosmic time.

2. Aims and Objectives

The student will search for HI detections of AGN in MeerKAT data from the MIGHTEE survey and from Open Time UHF observations. The primary technique will be to identify bright AGN in the field from the continuum data, then search for associated HI absorption in both L-band and UHF-band data. This project has the potential to make one of the highest redshift detections of hydrogen gas in an individual AGN.

3. Potential Impact

This project can help to shed light on several outstanding questions related to AGN and galaxy evolution, and to focus areas of the SKA, including: What is the extent of star formation inside AGN host galaxies during different phases of activity? How is this related to the HI gas content and feedback mechanisms? What is the connection between the fuelling and final point of star formation?

4. Alignment with national imperatives

This project aligns with the following national imperatives:

i) NRF Broad Category: Environmental, Material, Physical and Technology: Astronomy is a physical-technical discipline and strong usage will be made of cutting-edge technology in South Africa (MeerKAT telescope).
ii) National Priority: Transformation: the training of transformed, science-and-technology based researchers is the basis of South Africa's future in the Fourth Industrial Revolution.
iii) Grand Challenge: Astronomy: this project is astronomy, where usage is made of South Africa's cutting-edge technology to understand the Universe and our place in it.
iv) Sustainability Goals: Quality Education. Astronomy is a STEM-discipline that forms the basis of the future development of South Africa and an educated population.

5. National infrastructure platforms

SARAO/MeerKAT