LADUMA (Looking At the Distant Universe with the MeerKAT Array) is an approved MeerKAT survey aiming to measure neutral hydrogen (HI) gas in galaxies out to redshifts $z \sim 1.4$, to study its evolution over two-thirds of the age of the universe. The proposers of this SALT-Stobie project, Andrew Baker and Eric Gawiser (both faculty at Rutgers), are a co-PI of LADUMA and a co-lead of the LADUMA ancillary data working group, respectively. LADUMA observations will incorporate ~3300 hours on a single pointing encompassing the Extended Chandra Deep Field-South (ECDF-S). Headline goals of the survey include measuring the cosmic neutral gas density as a function of redshift and environment; the HI mass function and how the gas properties of galaxies depend on their properties such as stellar and halo mass beyond the local universe; and the evolution of the baryonic Tully-Fisher relation over cosmic time.

LADUMA has recently (November 2021) issued its first internal data release, composed of 105 hours of observations in the L-band ($0 < z < 0.56$). Projects with this first dataset are about to start. One such project is to measure the cosmic neutral hydrogen density in the LADUMA field. The neutral hydrogen mass within a given cosmic volume as a function of redshift is important for understanding the changes in the star formation rates of galaxies over cosmic time. Probing the cosmic neutral hydrogen density at intermediate redshifts (inaccessible to absorption line studies) using HI -- measurable with LADUMA data -- is particularly critical for understanding this evolution. To accomplish this feat, the spectral stacking technique will be used. Stacking allows for statistical detections of HI by shifting and averaging the HI spectra of large galaxy samples. Accurate spectroscopic redshifts are needed to align the expected 21 cm signals.

To supplement MeerKAT observations, the LADUMA ancillary data working group has been compiling multiwavelength datasets in the ECDF-S. Spectroscopic redshifts are a vital component of the LADUMA ancillary data, and an area where SALT is already poised to play a role, due to significant incompleteness in the $0.4 < z < 0.6$ range. Previous SALT proposals (2017-1-MLT-014, 2019-1-MLT-010) observed galaxies in the ECDF-S with photometric redshifts in this range using multi-object spectroscopy on RSS. While a basic reduction has been done for some of the data, a consistent reduction for the full sample is needed, as well as stacking of the spectra where there were multiple visits, quality checks, and template fitting to measure the redshifts. Gawiser's research group has a parallel RSS MOS program for which a pipeline including wavelength and flux calibration and redshift identification is being developed, and the student visitor will be encouraged to take advantage of this local expertise.

We request a SALT student research visit to Rutgers University for approximately 3-6 months to concentrate on LADUMA science using MeerKAT, SALT, and other multiwavelength data. This opportunity will help to strengthen collaboration within the distributed LADUMA team (UCT Associate Professor Sarah Blyth, also a LADUMA co-PI, and SALT Astronomer Ros Skelton are involved in the project on the South African side) and make use of the expertise available at Rutgers for the training of a South African PhD student. It will also provide an important opportunity for a South African student to meet and work with international collaborators and other students involved in LADUMA. It makes use of an already existing synergy between MeerKAT and SALT, and during the visit we expect to also work on follow up SALT proposals of LADUMA galaxies in collaboration with our South African colleagues.