Predictions and Detections of High Mass Galaxies in CHILES
USNC-URSI National Radio Science Meeting

Monica C. Sanchez Barrantes[1,2], Patricia A. Henning [1], Emmanuel Momjian[2], and Jacqueline van Gorkom[3]

(1) Department of Physics and Astronomy, University of New Mexico, Albuquerque, NM 87131, USA
(2) National Radio Astronomy Observatory, P.O. Box 0, Socorro, NM 87801, USA
(3) Department of Astronomy, Columbia University, New York, NY 10027, USA

Hydrogen is the fuel for star formation, but relatively little is known about the role of cold gas in galaxy evolution. The COSMOS H I Large Extragalactic Survey (CHILES) is an on-going deep (1000 hr) H I survey being carried out with the Karl G. Jansky Very Large Array (VLA), probing a 0.5 degree region within the COSMOS field in the 21cm line of neutral hydrogen. CHILES is the first survey to observe the H I 21 cm line in emission from z = 0 to z ~ 0.5, allowing us to observe the content, morphology and kinematics of the neutral hydrogen in relation to stellar disks, and how it may have evolved over this period. Here, we will present the results of a simulation of the galaxy detections possible with this survey, with an emphasis on the high-mass galaxies which should be detectable in the first 178 hours of the survey (epoch I). The results of the simulations will be compared to the galaxies actually detected within this fully reduced epoch I data. This will be contrasted with predictions of galaxy detections using artificial sources of similar scale inside of existing CHILES image cubes.

The results of our galaxy detections will be used to calculate and refine the high-mass end of the H I mass function (HIMF). The HIMF describes the intrinsic distribution of galaxies as a function of their H I mass. Because cosmological simulations make use of gas content and environmental factors, studying variations in the HIMF due to changes in redshift and environment can constrain the current models of galaxy formation. The HIMF has been well-studied in the local universe (e.g. Zwaan et al. 2005, Jones et al. 2018), and a Schechter function has been found to fit the data well. This function uses a power law to describe the low-mass slope and an exponential decline for the high-mass end. With the full 1000-hr CHILES data, we should be able to detect galaxies with H I masses of $\geq 3 \times 10^{10} M_{\odot}$ at the highest redshifts in our survey, and using these to calculate the high-mass end of the HIMF as a function of redshift.