

Neutral Hydrogen Observations of Satellite Galaxies Around Milky Way Analogs

Abstract

We request 55 hours of total observing time to image the HI distributions of 67 satellite galaxies around 21 Milky Way (MW) analogs. There exist a few key "small-scale" challenges to the Lambda-CDM cosmology which have yet to be thoroughly studied in a significant number of systems beyond the Local Group (LG). The Satellites Around Galactic Analogs (SAGA) survey aims to characterize the satellites as faint as Leo I ($M_r < -12.3\text{mag}$) within the projected virial radii of MW analogs. The 36 SAGA satellite systems studied so far starkly contrast the LG satellites and hydrodynamical simulations of MW analogs as the vast majority of the SAGA satellites (120/127) are star-forming. This fact strongly implies that these systems likely possess significant enough HI reservoirs for star formation. Therefore, we propose to use MeerKAT's sensitivity and flexibility to obtain HI imaging of a subset of the SAGA satellite systems in order to achieve three primary goals: (1) estimate their HI masses which will be used to derive key properties (e.g. quenching timescales) and investigate environmental trends, (2) conduct the first deep, untargeted HI search for signs of interactions, HI streams, and possibly additional satellites of MW systems, which will lay the foundation for an alternative, more efficient survey method of searching for satellites of MW analogs, and (3) model the kinematics of 40 satellites, resolved by at least 3 resolution elements, to enable the first statistical constraints on galaxy scaling relations at low stellar masses in other MW-like systems.