Title

Precision cosmology with the MeerKAT-UHF Large Area Synoptic Survey

Abstract

Building on recent successful observations in the L and UHF bands, we propose a wide survey to probe the cosmological HI distribution from redshifts 0.35·1.45 using the single dish intensity mapping (IM) technique in the MeerKAT UHF band. The total requested time of 2,480h will observe most of the Southern sky outside the Galactic plane (~10,000 deg2) and will enable us to measure the baryon acoustic oscillations and redshift space distortions with high signal-to-noise ratio, which will be a world first for IM. These will provide constraints on the nature of dark energy, the Hubble parameter, and the growth rate of large-scale structure. The survey will also make transformational measurements of the power spectrum on ultra-large scales and constrain primordial non-Gaussianity. It will take full advantage of and provide invaluable data for cross-correlations with surveys at other wavelengths (DESI, 4MOST, Euclid, DES, Rubin/LSST), a crucial step in reducing systematic effects for precision cosmology. Simultaneously with the single dish data, we will produce continuum images from the interferometer using the on-the-fly technique, with an angular resolution of 13· and rms of 25 ·Jy in Stokes I, while covering a unique frequency window from 550·1050 MHz. The combination of single dish and interferometer data will have exceptionally high legacy value. This first large multi-dish auto-correlation IM survey · the MeerKAT Large Area Synoptic Survey (MeerKLASS) · will mark an important milestone for cosmology with SKAO and further strengthen South African leadership in this future instrument.