Progress on HIRAX, the Hydrogen Intensity and Real-time Analysis eXperiment

Dr. Benjamin RB Saliwanchik*, for the HIRAX Collaboration
University of KwaZulu-Natal, Durban, South Africa

The Hydrogen Intensity and Real-time Analysis eXperiment (HIRAX) is a planned radio telescope array that will consist of ∼1000 close packed 6 m dishes that will be deployed in South Africa. HIRAX will survey the majority of the southern sky to measure baryon acoustic oscillations (BAO) using the 21 cm hyperfine transition of neutral hydrogen. The telescope is optimized to measure the 100 h^{-1}Mpc BAO scale by measuring integrated emission from many neutral hydrogen sources ("intensity mapping"). It will operate between 400-800 MHz in 1024 frequency bins, corresponding to a redshift range of $0.8 < z < 2.5$ and a minimum $\delta Z/Z$ of ∼0.003. By measuring the BAO length scale as a function of redshift, HIRAX will chart the expansion history of the universe and place constraints on the dark energy equation of state. In addition to BAO cosmology, the large survey area and real-time analysis capabilities of the HIRAX array will make it a powerful tool for identifying pulsars and astrophysical transients such as fast radio bursts. HIRAX will additionally provide an excellent platform for studying neutral hydrogen absorbers, and the extensive overlap with the Large Synoptic Survey Telescope (LSST) will enable cross-correlation studies of radio and optical tracers of large scale structure. The deployment and testing of an eight-element prototype array at the Hartebeesthoek Radio Astronomy Observatory (HartRAO) is currently underway, and build out to the 128-element pathfinder array is expected to begin in 2017. This presentation describes the telescope design, and current plans for deployment and calibration, focusing on progress made since the previous National Radio Science Meeting.