HIRAX: The Hydrogen Intensity and Real-time Analysis eXperiment

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A new frontier of radio astronomy is using the redshifted 21-cm emission line of neutral hydrogen to reconstruct a vast three-dimensional map of large-scale structure in the universe. These maps will encode a faint imprint, known as baryon acoustic oscillations (BAOs), that correspond to remnant ripples left behind by sound waves echoing through the plasma of the early universe. Measurements from upcoming experiments will constrain BAOs with exquisite precision, opening new views into structure formation and the universe's expansion history, and shedding light on the mystery of dark energy.

I will describe a new radio telescope array called the Hydrogen Intensity and Real-time Analysis eXperiment (HIRAX), which has the goals of measuring BAOs, searching for pulsars, detecting fast radio bursts and other transients, finding neutral hydrogen absorbers, and other auxiliary science. HIRAX will map most of the southern sky (in a declination range of -60° to 0°) over a frequency range of 400–800 MHz, and the planned location is the South African Square Kilometer Array (SKA) site. The array will consist of roughly 1000 6-m stationary dishes placed in a compact, redundant configuration. HIRAX is in its initial planning stages and has been conditionally approved by the South African National Research Foundation, pending a detailed site agreement with the SKA. The first prototype dish arrived in Durban in July 2015, and commissioning is in progress. We expect to begin constructing an eight-element prototype array at the Hartebeesthoek Radio Astronomy Observatory in early 2016. I will discuss the status of the HIRAX instrument, upcoming plans, and science prospects.