

## Commissioning of the HIRAX eight-element pathfinder

Austine A. Gumba for the HIRAX collaboration  
University of KwaZulu–Natal, Durban, South Africa

The Hydrogen Intensity and Real-time Analysis eXperiment (HIRAX) is a new redshifted 21-cm intensity mapping experiment that is currently under development in South Africa. The main science goal of HIRAX is to constrain dark energy by mapping the distribution of neutral hydrogen in the southern sky over a redshift of 0.8–2.5, which corresponds to a frequency range of 400–800 MHz. The baryon acoustic oscillations that are encoded in these maps have a characteristic length scale that can serve as a “ruler” for charting the expansion of the Universe and illuminating the nature of dark energy. Other HIRAX science goals include searching for pulsars, fast radio bursts and other transients, finding neutral hydrogen absorbers, measuring diffuse Galactic foreground emission, and other auxiliary science. The final HIRAX array will be comprised of 1024 6m parabolic dishes in the Karoo desert, located near the South African Square Kilometre Array site. An eight element prototype has been constructed at the Hartebeesthoek Radio Astronomy Observatory, and commissioning is currently in progress.

I will describe the HIRAX eight-element prototype in detail, including project specifications, an overview of the system layout, and integration and characterization of the subsystems. We are testing and refining various aspects of the subsystems. These include dish fabrication, receiver housing, and lightning protection, as well as front end electronics, and RF over optical fiber modules. I will present preliminary data from end-to-end system tests. Construction of a 128-element array in the Karoo desert will commence at the end of 2019, and I will describe plans and progress toward finalizing the HIRAX subsystems in preparation for deployment of the first science-grade elements.