HIRAX INSTRUMENT CHARACTERIZATION

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The Hydrogen Intensity and Real-time Analysis eXperiment (HIRAX) is a 21 cm neutral hydrogen intensity mapping experiment to be deployed in the Karoo Desert in South Africa. It will consist of 1024 6m dishes, and will map much of the southern sky over the course of four years. HIRAX will operate at 400-800MHz, thereby exploring the redshift range $0.8 < z < 2.5$ and allowing us to make new measurements of BAOs and in turn constrain the Dark Energy equation of state parameters. As with all 21cm science, galactic foregrounds contaminate our band, and so meeting our science goals will require precise characterization of our instrument. This talk will focus on two aspects of our instrument characterization: noise temperature measurements and drone beam mapping. I will discuss a novel apparatus for determining antenna noise temperature in which we use identical loads, one cryogenic and the other at room temperature, to take a differential measurement (y-factor measurement) to infer the noise of our system. Simulations predict this set up will allow us to understand our noise temperature to within 10%. The apparatus is currently being built at Yale, and will be used to test current and future generations of feeds. Additionally, I will describe the status of drone calibration measurements, which will be critical to understanding our beams and controlling potential systematic errors. I will specifically touch on requirements to achieve accurate beam calibration and methods for checking in flight data sets for accuracy. I will also report initial data, and describe future plans.