

## Searching for Cosmic Dawn from the Sub-Antarctic with SCI-HI

H. Cynthia Chiang for the SCI-HI collaboration  
University of KwaZulu–Natal, Durban, South Africa

Measurements of redshifted 21-cm emission of neutral hydrogen have the potential to probe a wide range of epochs in the universe’s history. At frequencies below  $\sim 150$  MHz, redshifted 21-cm emission can open an observational window into cosmic dawn, when the first stars were born. The global 21-cm signal, averaged across the sky, captures the heating processes of these first stars and is expected to have a characteristic  $\sim 100$  mK dip around a redshift of 20. The SCI-HI experiment is an instrument that has been designed to study cosmic dawn in the universe using 50–150 MHz observations of globally averaged 21-cm emission. The experiment consists of a compact, modified four-square antenna that is portable and can be easily transported to different observing sites. One of the greatest challenges for SCI-HI is terrestrial radio-frequency interference (RFI), which overwhelms the cosmological signal even when the nearest RFI sources are hundreds of kilometers away. Because SCI-HI observes total power, the required level of RFI control is far more stringent than for interferometric experiments, which benefit from crosscorrelations. SCI-HI previously deployed to Guadalupe Island (200 km off the coast of Mexico) and established the most stringent upper limits on the global 21-cm signal at redshift  $\sim 20$  ( $\sim 70$  MHz) at the time. The residual RFI levels were about an order of magnitude larger than the expected cosmological signal, and it is plausible that RFI contamination could be reduced further by moving to an even more remote observing location.

Following the Guadalupe measurements, SCI-HI has entered a new experimental phase and has been approved for deployment to Marion Island in the sub-Antarctic through the South African National Antarctic Programme. Marion Island lies roughly 2000 km from the nearest continental land masses, representing an order-of-magnitude improvement in isolation relative to Guadalupe. SCI-HI’s first Marion deployment took place in April 2016, and the experiment will deploy a second time in April 2017. I will discuss the current status of SCI-HI, our assessment of the RFI environment on Marion Island, lessons learned in surviving the Roaring Forties, and plans for the upcoming deployment.