PROBING COSMIC INFLATION:
TESTING NOVEL HIGH-SENSITIVITY DETECTORS
FOR NEXT-GENERATION SURVEYS

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April 11, 2024

Abstract

Next-generation cosmological surveys will require detectors with unprecedented sensitivity that can measure the faint "relic radiation" of the early universe. This "relic radiation," also known as the cosmic microwave background, exhibits faint patterns which reveal how the universe expanded just after the Big Bang. Kinetic inductance detectors are an emerging technology that is well-suited for measuring very faint signals. I am testing prototypes of a novel detector design—multichroic microwave kinetic inductance detectors—which are sensitive to two frequency ranges simultaneously. The ability to simultaneously observe at multiple frequencies facilitates the efficient removal of contaminating foreground sources from the data, which is necessary to recover the signal of interest. I am preparing to test the performance of prototype detector arrays to demonstrate their suitability for next-generation surveys. First, I will describe the prototype arrays and planned testing protocol. Then, I will discuss the cryogenic testbed, including the thermal loading issues we encountered and the modeling and redesign I undertook to solve them. Next, I will discuss the readout system I built and the tests I conducted to verify its performance. Finally, I will summarize the work I have done in Chile at the Simons Observatory working to deploy the new SAT-UHF telescope.