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Systematics in the On-Sky Performance of the Microwave-SQUID Multiplexer

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Cryogenic sensor arrays for the next generation of scientific applications require more pixels and higher multiplexing factors. In recent years, microwave SQUID multiplexing (μmux) has emerged as a promising candidate for achieving large multiplexing factors with low readout noise penalty while reducing integration complexity and readout cost per sensor. In μmux, the current from each transition edge sensor (TES) is coupled as a flux to a superconducting loop containing a single Josephson junction. The flux applied to the loop acts as a variable inductor that shifts the frequency of a microwave resonator. Each resonator has a unique center frequency, allowing many to be read out on one coaxial line. In the austral summer of 2018-2019, we installed a 528-channel microwave SQUID multiplexed readout on a 150 GHz focal plane for cosmic microwave background (CMB) observations with the Keck Array at the South Pole. Here, we discuss systematic errors of the microwave SQUID readout, including characterization of crosstalk in the frequency domain and readout noise from resonators uncoupled to TESes. The results are promising for the viability of microwave SQUID multiplexing for future TES readout applications.

Less than 5 years of experience since completion of Ph.D

Y

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