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Superconducting Detector Arrays for Cosmic Microwave Background Measurements

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Advances in superconducting detector arrays are driving progress in the field of cosmic microwave background (CMB) measurements. In the last decade ground-based CMB projects have employed arrays of thousands of superconducting transition-edge sensors (TESes) to make great progress in cosmological constraints from early universe inflation to the Hubble expansion rate. These arrays are operated at sub-Kelvin temperatures and utilize superconducting quantum interference device (SQUID) amplifiers to multiplex and amplify the TES signals before they are digitized. Kinetic inductance detectors (KIDs) are a newer superconducting detector technology that are naturally multiplexed in frequency and have been deployed at smaller scales with promising results. We review the development of arrays of TESes and KIDs, then describe the progress being made in scaling these technologies towards tens of thousands and hundreds of thousands of detectors for the upcoming Simons Observatory, CCAT-prime, and CMB-S4 projects.

Collaboration

CCAT-prime, Simons Observatory, and CMB-S4 Collaborations

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