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## Commercially fabricated antenna-coupled Transition Edge Sensor bolometer detectors for next generation Cosmic Microwave Background polarimetry experiment

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We report on the development of commercially fabricated multi-chroic antenna coupled Transition Edge Sensor (TES) bolometer arrays for Cosmic Microwave Background (CMB) polarimetry experiments. The orders of magnitude increase in detector count for next generation CMB experiments require a new approach in detector wafer production to increase fabrication throughput.

We describe collaborative efforts with a commercial superconductor electronics fabrication facility (SeeQC-HYPRES, Inc.) to fabricate antenna coupled TES bolometer detectors. We have successfully fabricated an operational dual-polarization, dichroic sinuous antenna-coupled TES detector array on a 150 mm diameter wafers. The fabricated detector array has yields of over 96% and excellent uniformity across the wafer. We have also demonstrated stable detector performance over 4 months. Both RF characteristics and TES bolometer properties are suitable for CMB observations. We successfully fabricated different types of TES bolometers optimized for frequency-multiplexing readout, time-domain multiplexing readout, and microwave SQUID multiplexing readout. We discuss the motivation, design considerations, fabrication processes, test results, and how industrial detector fabrication could be a path to fabricate hundreds of detector wafers for future CMB polarimetry experiments.

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

N

### Student (Ph.D., M.Sc. or B.Sc.)

N

**Primary author:** Dr SUZUKI, Aritoki (Lawrence Berkeley National Laboratory)

**Co-authors:** Mr COTHARD, Nicholas (Cornell University); Prof. LEE, Adrian T. (University of California, Berkeley); Prof. NIEMACK, Mike (Cornell University); Dr RAUM, Christopher (University of California, Berkeley); Dr RENZULLO, Mario (SeeQC-HYPRES, Inc.); Mr SASSE, Trevor (University of California, Berkeley); Mr STEVENS, Jason (Cornell University); Dr TRUITT, Patrick (SeeQC-HYPRES, Inc.); Ms VAVAGIAKIS, Eve (Cornell University); Dr VIVALDA, John (SeeQC-HYPRES, Inc.); Dr WESTBROOK, Benjamin (University of California, Berkeley); Dr YOHANNES, Daniel (SeeQC-HYPRES, Inc.)

**Presenter:** Dr SUZUKI, Aritoki (Lawrence Berkeley National Laboratory)

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