Microfabrication of Arrays of Superconducting Transition Edge Sensors for CMB Measurements

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The cosmic microwave background (CMB) provides a unique window for exploring fundamental physics. Increasing the sensitivity of CMB experiments requires fabricating focal planes with orders of magnitude more detectors than current instruments. This work presents the procedures used at Argonne National Laboratory for the fabrication of large arrays of dual-polarized multichroic detectors for CMB measurements. The detectors are composed of a broad-band sinuous antenna coupled to a Nb microstrip transmission line. In-line filters define the spectral response, allowing for individual measurement of three band-passes (95 GHz, 150 GHz and 220 GHz). A Ti/Au termination resistor is used to couple the mm-wave signal to Ti/Au transition edge sensor (TES) bolometers. There are six bolometers per pixel, for a total of 16,140 detectors in the CMB receiver being fabricated. The monolithic microfabrication of the detector arrays will be presented and discussed in detail.

1The SPT3G collaboration is developing the third-generation camera for CMB measurements with the South Pole Telescope. Additional information can be found in the following link: https://pole.uchicago.edu/spt/

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