

MULTIPLEXING SUPERCONDUCTING BOLOMETER ARRAYS

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ABSTRACT

The next generation of far-infrared and submillimeter instruments require large arrays of detectors containing thousands of elements. A multiplexed readout is necessary for practical implementation of such arrays, and can be developed using SQUIDs coupled to superconducting bolometer arrays. In this implementation, a 32x32 array of bolometers can be read out using ~100 wires rather than the >2000 needed for direct wiring. We describe the development of multiplexing as a step toward bringing about the first astronomically useful bolometer arrays of this design. We have implemented time-domain multiplexing, as this has several practical – although no theoretical – advantages over frequency-division multiplexing. New electronics and software have been developed to implement this multiplexing scheme, which has resulted in the first multiplexed detection of submillimeter light and the first multiplexed astronomical observations. We have demonstrated the ability of these multiplexers to transduce the Johnson noise of detectors with negligible additional noise. Recent improvements in the multiplexer design have allowed us to further simplify and improve the system performance, including the development of cryogenic address selection logic.

Editor's note: The manuscript of this presentation is not available for the proceedings.

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