

Development of Transition-Edge Sensor Arrays at NIST

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Superconducting Transition-Edge Sensors (TESs) consist of thin superconducting films electrically biased in the resistive transition. When combined with a radiation coupling structure such as an antenna or a bulk foil, TESs operated at sub-Kelvin temperatures can measure photons from microwave to gamma-ray energies with unprecedented precision. In this presentation, we describe the development and deployment of arrays of up to ten thousand TES sensors at NIST. SQUID multiplexing circuits are a critical enabling technology for these arrays. We briefly describe several instruments incorporating TES arrays with SQUID readout and their intended applications. These include gamma-ray sensors for nuclear materials accounting, x-ray sensors for ultrafast time-resolved absorption spectroscopy and industrial materials analysis, and submillimeter and millimeter-wave sensors for astronomy including active efforts to measure B-mode polarization in the cosmic microwave background.

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