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## Nuclear materials analysis using an array of gamma-ray transition-edge sensors and microwave SQUID readout

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In 2018, we commissioned a gamma-ray spectrometer at Los Alamos National Laboratory consisting of 256 Transition-Edge Sensors (TESs) for high-resolution measurements of photon energies up to and beyond 200 keV. This instrument, called SLEDGEHAMMER, is the first fielded microcalorimeter instrument to be read out using microwave SQUID multiplexing. In this presentation, we discuss the performance of SLEDGEHAMMER and recent efforts to streamline its data analysis pipeline. We also discuss the challenging problem of extracting both the source-detector efficiency curve and the composition of complex materials from the gamma-ray spectra measured with SLEDGEHAMMER. We have acquired spectra from a variety of actinide-bearing sources relevant to the nuclear fuel cycle, including used nuclear fuel containing fission products. We discuss the accuracy of the derived material compositions as well as efforts to understand and reduce the limiting sources of error. The broader goal of this work is to assess the suitability of cryogenic detectors for nuclear materials analysis and accounting applications. Finally, we describe early-stage projects to further advance gamma-ray TES technology including the development of a more capable spectrometer for permanent installation in the analytical laboratory of a US nuclear facility.

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

N

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

N

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