

Poster

256-pixel Microcalorimeter Array for High-resolution Gamma-ray Spectroscopy

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The application of transition-edge sensor (TES) microcalorimeter detectors to gamma- and X-ray spectroscopy provides the opportunity for significant advances in measurement accuracy and precision for a variety of nuclear safeguards and material accountability applications. The energy resolution capabilities these detectors are ideally suited as a non-destructive means to accurately and precisely determine the isotopic content of complex radioactive samples. A recently fabricated 256-pixel microcalorimeter array exhibits an average pixel FWHM of 56 eV at 97 keV and the capability of total array count rates exceeding 3,000 cps. For measurements of mixed-actinide samples with count rates approaching 1,000 cps, the average detector FWHM achieved is 72 eV with 87% of pixels obtaining quality spectroscopic data. Progress in the development of this microcalorimeter detector array, recent results from stable, high-resolution operation with increasing count rate, as well as the application of this technology to Plutonium isotopic analyses will be discussed. Quantitative isotopic analyses of mixed-isotope Plutonium standards using the largest gamma-ray microcalorimeter array to-date will be presented.