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## Automated Drift Correction, Coadding, and Energy Calibration of Large Array Microcalorimeter Data

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Large arrays of microcalorimeters with hundreds of pixels are needed for detection efficiency, but present challenges for data processing. In typical applications of microcalorimeter x-ray and gamma-ray spectroscopy, the desired output is a single energy-calibrated spectrum made by combining data from the individual pixels. This data processing often requires significant input from an expert user or sample-specific analysis scripts. Robust, automated data processing that requires no knowledge of the sample being measured is an important enabling technology for the widespread use of high-resolution microcalorimeter spectroscopy. We are working towards this goal by developing software tools to drift-correct peaks in each single-pixel spectrum, coadd the single-pixel spectra via pattern recognition, and, in the case of gamma spectra, energy calibrate using x-ray escape and fluorescence peaks. In our approach, the process is drift correction, coadding, and then energy calibration. Peaks for drift correction are automatically identified and undergo a spline fitting procedure to determine the shape of temporal drift correction. Subsequently, correlation between pulse record pretrigger mean and pulse amplitude is used to further improve peak resolution. After drift-correction, the peaks in the individual-pixel spectra are found and matched to an automatically-chosen template spectrum from a pixel within the dataset. The coadded spectrum can then be energy calibrated with the benefit of increased statistical precision compared to the single-pixel spectra. Used in combination with known fluorescence x-ray peaks, the known spacing of escape peaks from the primary peaks provides an accurate, completely automated energy calibration with no knowledge of the sample being measured. We will present results from this method applied to a variety of gamma and x-ray microcalorimeter spectra.

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

N

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

Y

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