GPU Based Nearline Analysis System for the Nab Experiment[1]

DAVID MATHEWS, University of Kentucky, NAB COLLABORATION — The Nab neutron decay correlation experiment will utilize a pair of 127-pixel silicon detectors to measure the electron-neutrino correlation coefficient from the 2D energy distribution of protons and electrons. For each decay event, analog signals from 30 pixels are digitized at a rate of 250 MHz resulting in an approximately 50 MB/s data rate. First-order timing and energy results are extracted by the data acquisition firmware using traditional filtering techniques, but in order to reach the precision goals of the experiment, a new technique is required. A GPU-based weighted least squares fitting routine has been developed that fits template waveforms, while subtracting baseline noise features, at an excess of 100 MB/s per GPU. This system will be used as part of the data acquisition process as well as during offline analysis on GPU clusters.

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