## Abstract Submitted for the DNP06 Meeting of The American Physical Society

The Utilization of Free-Running Digital Signal Processors as a Method of Multi-channel Analysis<sup>1</sup> CHRIS MCGRATH, MATTHEW NICHOLS, PHILLIP WOMBLE, ALEX BARZILOV, IVAN NOVIKOV, JEREMY BOARD, JOHN PASCHAL, Western Kentucky University — A new generation of neutron-based explosives detection systems is beginning to be built. However, these systems are handicapped by low through-put data acquisition systems. We are developing a faster data acquisition system using a continuously digitizing ("free running") analog to digital converter. In our method, the incoming electrical signals are processed directly from the anode output of the voltage divider chain on the photo-multiplier tube. The shape and duration of the waveform to be analyzed is strongly dependent on the time constants of the RC components in the last stages of the voltage divider chain. The rise times of these signals are typically less than one hundred ns and their fall times are much longer (>5  $\mu$ s). Signal filters and signal amplitudes are calculated from the digital data stream without any front-end analog electronics. In addition, signals which normally would be rejected during high-counting rates because of "pile-up" conditions can be recovered under certain circumstances. This will allow the faster investigation times and reduce risk to personnel and the public. A potential spin-off application is the utilization of these electronics in medical imaging such as PET scanning.

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