Contribution ID: **468** Type: **Oral Presentation**

Ultrahigh Resolution CZT/CdTe Detectors with a Hybrid Pixel-Waveform Readout System

Thursday, 9 June 2011 17:20 (20 minutes)

In this paper, we will report on the development of a hybrid pixel-waveform (HPWF) readout system for highly pixelated (with a few hundred um pitch size) CZT and CdTe gamma ray detectors. This readout system is based on an energy-resolved photon counting (ERPC) ASIC for reading out the anode pixels, working in coincidence with a high-speed circuitry for sampling the cathode waveform. This approach could provide an ultrahigh spatial resolution, an excellent timing resolution and a reasonable spectroscopic performance at the same time. The rationales behind the HPWF readout system are the following. First, the cathode waveform could provide precise energy information using digital processing techniques that takes into account the effect of charge trapping. This helps to alleviate the difficulties in extracting energy information from the tiny anode pixels, with the presence of severe charge sharing and charge loss. Second, the cathode waveform could provide timing information at a precision well beyond that available with anode pixel readout. The latter is limited by the intrinsic uncertainties in charge collection process. Finally, this method could also provide reliable DOI information, by measuring the electron drifting time in sampled waveforms. In contrast, deriving DOI information from the cathode-to-anode ratio is unreliable for detectors having pixel sizes similar to or smaller than the anticipated signal electron cloud size in the detector. In summary, the proposed readout system provides a relatively practical solution for extracting precise energy, timing and spatial information from CZT or CdTe detectors, which could offer a promising candidate for future high-performance multi-modality gamma ray imaging systems.

Primary author: Prof. MENG, Ling-Jian (University of Illinois at Urbana-Champaign)

Co-author: Mr CAI, Liang (University of Illinois at Urbana-Champaign)

Presenter: Prof. MENG, Ling-Jian (University of Illinois at Urbana-Champaign)

Session Classification: Instr. for Medical, Biological and Materials Res.

Track Classification: Instrumentation for Medical, Biological and Materials Research