Docket #: S07-003

High energy photon detection using pulse width modulation

Researchers in the Molecular Imaging Instrumentation Laboratory at Stanford University have developed a system for digitizing high energy photon readings for high energy photon-radionuclide detection systems, including PET (positron emission tomography). Traditional PET systems rely on the amplitude of an analog signal for photon detection. The Stanford technology encodes the time, energy, and location of each high energy photon interaction in a detector using the different arrival times of various edges of a digital signal. Therefore, the invention allows for robust delivery of the information signals to the back end data processing electronics with a large reduction in the number of readout channels. In one application, the technology could be used to effectively combine PET and magnetic resonance imaging modalities.

Ongoing Research
The electronics setup to implement the invention is currently being developed.

Applications

- **Medical imaging:**
  - PET
  - Gamma Ray Imaging
  - SPECT (single photon computed tomography)
- **Scintillation detectors** for:
  - high energy physics
  - oil well drilling
- **Defense** - gamma ray spectroscopy and imaging detection for nuclear weapons proliferation

Advantages

- **Low cost**:
  - simple and easy to create integrated circuits to implement pulse width modulation directly in detector
  - digital encoding of the signal onto a single wire allows more flexibility and drastically simpler data acquisition electronics over analog encoding of the signal
- **Scalable** - digital signals can be multiplexed without degradation, allowing for far fewer channels
- **Robust** - allows detectors to be placed in harsh environments where signals have to travel over great distances

Publications

- U.S. Patent Application No. 12/397,195

Patents

- Published Application: 20100025589
- Issued: 8,258,480 (USA)

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