Development and Demonstration of a Low-Cost, Strip-PET Scanner Prototype

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Positron Emission Tomography (PET) allows physicians to visualize metabolism in various organs and is widely used in cancer and neurological imaging. The radioactive tracer, usually Fluorodeoxyglucose (18F) accumulates in regions of high metabolism, such as cancer. Fluorodeoxyglucose emits positrons that annihilate with nearby electrons to produce two back-to-back gammas, allowing for the reconstruction of the emission line through surrounding detectors. Traditional PET scanners consist of several rings of highly segmented scintillation detectors lining the outside of an MRI scanner. They are expensive (1-2 million USD) due to the many (>10000) small detectors coupled with photosensors. An inexpensive (<50,000 USD) strip PET scanner is being developed using techniques from experimental particle physics, such as energy and timing, to recreate location. It uses a few long (â‰ˆ5 feet) scintillators, allowing the setup to be inside the strong MRI magnetic field, without disturbing the photomultiplier tubes (PMT) located outside the field. This design is expected to improve the detection efficiency of the gammas by avoiding Compton scatters in intervening MRI scanner material, a common occurrence in traditional PET scanners. A prototype 12-strip PET scanner shows promising results.

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