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Development of a high-performance PET scanner

Modern PET scanners are expected to achieve high sensitivity and exquisite time and position resolutions. These high-performance features can be accomplished by highly segmented scintillating crystal arrays and SiPM photosensors that are configured in a way to enable reconstruction of the depth of interaction (DoI) and the time of flight (ToF) using fast front-end electronics and data acquisition. We have conducted tests that include double-ended and single-ended readout and modified crystal surfaces to study their impact on DoI and ToF. We will discuss these efforts, detector simulations and laboratory tests in developing such PET scanners in the context of our Time-of-Flight PET for Proton Therapy (TPPT) project that focuses on a novel PET scanner designed and built to provide feedback for proton therapy treatments. Our goal is to achieve high-fidelity proton range verification that could open image-guided proton therapy.

Field

Systems and applications

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