

A PET Detector with Parallax-free Compton Enhanced 3D Gamma Reconstruction

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Abstract

We describe a novel concept for a PET detector module providing full 3D gamma reconstruction with high resolution over the total detector volume, free of parallax errors. The key components are a matrix of long scintillator crystals and Hybrid Photodiodes with matched segmentation and integrated readout electronics. They read out the two ends of the scintillator package. Excellent spatial resolution (particularly in the transaxial plane) and energy resolution is obtained. The concept allows to enhance the gamma detection efficiency by reconstructing a significant fraction of events which underwent Compton scattering in the scintillators.

Proximity focused Hybrid Photodiodes optimized for this application are under development. They consist of a round ceramic body with a very thin sapphire entrance window, sealed to a base plate on which the silicon sensor and the self triggering readout electronics are mounted. In a second phase rectangular photodetectors will be developed in order to maximize the active area coverage.