The AX-PET project: Demonstration of a high resolution axial 3D PET

A novel geometrical concept for a high resolution 3D PET, based on an axial geometry (AX-PET), has been proposed in 2007. A demonstrator comprising two detector modules is currently under construction. One PET module consists of a 6 x 8 matrix of long LYSO scintillating crystals, axially oriented in the scanner. Arrays of wavelength shifting (WLS) strips are interleaved orthogonally between the layers of LYSO crystals. Crystals and WLS strips are individually read out by Geiger mode APDs (Hamamatsu MPPC). The modular AX-PET geometry allows for a precise measurement of the photon interaction point in the three dimensions (depth of interaction), resulting in good spatial resolution and high sensitivity. The photons can be tracked in the three dimensions and therefore also Compton scattered events (inter-crystal scattering) can be resolved. To exploit the full potential of the AX-PET concept, Monte Carlo simulations and dedicated image reconstruction software are under development. The operating principle of the AX-PET and the performance achieved will be described, based on results from test setups and calibration measurements.