The AX-PET experiment: Demonstration of a novel PET concept

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PET (Positron Emission Tomography) is a tool for medical imaging, successfully used since the earliest days of nuclear medicine. In recent years, significant progress in PET instrumentation has been achieved, taking strong advantage from the migration of technologies originally developed for high energy physics experiments into prototype PET devices.
The AX-PET experiment proposes a novel geometrical approach for a PET scanner, in which long scintillator crystals (LYSO) are placed axially in the tomograph, and arrays of WLS strips are used to measure the axial coordinate. Crystals and WLS strips are individually readout by Silicon Photomultipliers (SiPM). Two AX-PET modules have been built at CERN, and fully characterized with point-like Na-22 sources, demonstrating competitive detector performance. Used in coincidence and mounted on a dedicated gantry system, the two modules represent a fully operational demonstrator for a PET prototype, which has been used for the reconstruction of images of several phantoms filled with radiotracers, as well as for small animals image reconstruction.
Since recently, digital Silicon Photomultipliers (dSiPM) from Philips are being investigated as alternative photodetectors for the AX-PET. With their highly integrated readout electronics and very good intrinsic time resolution, dSiPM's may allow compact detector modules with Time of Flight capability (TOF-PET).
The axial concept, the AX-PET detector, its performance and its major results in terms of reconstructed images, as well as the results from the measurements with the dSiPM, will be described.