

EndoTOF PET-US, a dedicated detector for pancreas and prostate biomarkers developments

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In the scope of the EndoTOFPET-US project, a novel multimodal device for Ultrasound (US) Endoscopy and Positron Emission Tomography (PET) is being developed. The project aims at detecting and quantifying morphologic and functional markers and developing new biomarkers for pancreas and prostate oncology. Exploiting the Time-of-Flight (TOF) information of the gamma rays allows for a more sensitive, more precise and lower radiation-dose imaging and intervention on small internal structures. The detection of the gamma rays is realized with the help of scintillator crystals with Silicon Photomultiplier (SiPM) read-out, aiming at a coincidence time resolution of 200 ps and a spatial resolution of ≈ 1 mm. For the endoscopic detector, digital SiPMs are used for the first time in an instrument planned for clinical applications. The functionality of the instrument as well as the challenges that accompany the high miniaturization of the endoscopic detector and the asymmetric and variable geometry of the system, are presented. The demands on the system involve the fields of scintillating crystallography, ultra-fast photon detection, highly integrated electronics, system integration as well as image reconstruction. The single detector components have been fully characterized and are performing up to specifications. Two concurrent ASIC chips have been developed for the project. The first PET images have been acquired with a test setup that consists solely of hardware and software developed within the collaboration and demonstrate that the data acquisition and reconstruction chain is operational. In this talk, the characterization of the single components and the status of the detector integration and commissioning is presented.

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