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EndoTOFPET-US: a novel multimodal tool for endoscopy and positron emission tomography

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The EndoTOFPET-US project aims to jointly exploit Time-Of-Flight Positron Emission Tomography (TOFPET) and ultrasound endoscopy with a multi-modal instrument for diagnostic and therapeutic oncology.

The development of two novel detectors is required, a PET head extension for a commercial US endoscope placed close to the region of interest (ROI) and a PET plate over the patient's abdomen in coincidence with the PET head. Technological challenges include: 1 mm image spatial resolution (SR), an unprecedented 200ps Coincidence Time Resolution (CTR) for enhanced background rejection, online tracking of both detectors and image reconstruction of images with partial volume information from an asymmetric geometry.

The paper will present results achieved with the first prototype components of the EndoTOFPET-US detector. Characterization of 4096 LYSO crystals glued to 256 Hamamatsu MPPC matrices of 4x4 photo-detectors each, performance tests of two candidate ASIC chips for fast TOF readout, and performance studies of the digital silicon-photomultiplier detector for the endoscopic probe will be presented.

The first system integration measurements will be shown, which demonstrate that the requirements in terms of SR and CTR are at reach.

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