Contribution ID: **353** Type: **Talk**

Development of High-Resolution Detector Module with Depth of Interaction Identification for Positron Emission Tomography

Thursday, 18 February 2016 14:25 (20 minutes)

We have developed a Time-of-flight high resolution and commercially viable SiPM based detector modules for the application in the new positron emission mammography (new ClearPEM) and other small organ specific PET scanners. The detector module has a single side readout and 4-to-1 coupling between LYSO crystals and SiPM, as opposite to the 1-to-1 coupling and double-side readout (with APDs) currently implemented into the ClearPEM. The crystal array consists of 8x8 pixels each with1.53x1.53x15 mm3 separated by reflective foils. The crystal array is optically coupled to 4x4 SiPM array and readout by a high performance front-end ASIC with TDC capability (50 ps time binning). Optical simulations of the detector module has been done in Geant4 to study the different crystal surface treatments, as well as several coupling configurations between scintillators and SiPM to optimize the performance of the module. In this paper we present the results for two detector modules being one made up of crystal pixels with all sides polished capable of identifying all 64 crystals and another one made up of crystal pixels with the longer sides unpolished to get both depth of interaction and crystal identification. The preliminary results show a timing resolution of 375 ps, an average DOI resolution of 3 mm sigma and an average energy resolution of 28% FWHM.

Primary author: NIKNEJAD, Tahereh (LIP)

Co-authors: DI FRANCESCO, Agostino (LIP Laboratorio de Instrumentacao e Fisica Experimental de Part); LEONG, Carlos (PETSys Electronics SA); AUFFRAY HILLEMANNS, Etiennette (CERN); STRINGHINI, Gianluca (Universita & INFN, Milano-Bicocca (IT)); VARELA, Joao (LIP Laboratorio de Instrumentacao e Fisica Experimental de Part); RASTEIRO DA SILVA, Jose Carlos (LIP Laboratorio de Instrumentacao e Fisica Experimental de Part); FERRAMACHO, Luis (PETSys Electronics SA); ROLO, Manuel (LIP); PAGANONI, Marco (Universita & INFN, Milano-Bicocca (IT)); PIZZICHEMI, Marco (Universita & INFN, Milano-Bicocca (IT)); SILVEIRA, Miguel (LIP Lisbon); LECOQ, Paul Rene Michel; BUGALHO, Ricardo (LIP); SILVA, Rui (LIP); TAVERNIER, Stefaan (Vrije Universiteit Brussel (BE))

Presenter: NIKNEJAD, Tahereh (LIP)

Session Classification: Medical Applications

Track Classification: Medical Applications