Contribution ID: **310** Type: **Talk**

State of the art time resolution in TOF-PET detectors for various crystal sizes and types

Thursday, February 18, 2016 2:00 PM (20 minutes)

Time of flight (TOF) in positron emission tomography (PET) has experienced a revival of interest after its first introduction in the eighties. This is due to a significant progress in solid state photodetectors (SiPMs) and newly developed scintillators (LSO and its derivates). Latest developments at Fondazione Bruno Kessler (FBK) lead to the NUV-HD SiPM with a very high photon detection efficiency of around 50%. Despite the large area of 4x4mm^2 it achieves a good single photon time resolution of 205±5ps FWHM. Coincidence time resolution (CTR) measurements using LSO:Ce codoped 0.4%Ca scintillators yield values of 73±2ps FWHM for 2x2x3mm^3, 83±4ps for 2x2x5mm^3, 100±4ps for 2x2x10mm^3 and 122±6ps for 2x2x20mm^3 crystal sizes. Results with standard LYSO:Ce are 95±5ps for 2x2x5mm^3, 105ps±4ps for 3x3x5mm^3, 130ps±5ps for 2x2x20mm^3 and 140ps±5ps for 3x3x20mm^3. A measured increase in cross-talk probability given by the crystal acting as a reflector could be a reason for the deteriorated CTR observed with the higher crystal cross-sections. Further measurements with various scintillator cross-sections (1x1mm^2 - 4x4mm^2) will be a basis for discussing this influence to timing in TOF-PET. Additionally, CTR measurements with LuAG and GGAG type samples are presented and the results are interpreted in terms of their scintillation properties, e.g. rise time, decay time, light yield and emission spectra.

Primary author: GUNDACKER, Stefan (CERN)

Co-authors: GOLA, Alberto (FBK); FERRI, Alessandro (FBK); PIEMONTE, Claudio (FBK); AUFFRAY HILLEMANNS, Etiennette (CERN); ACERBI, Fabio (FBK); PATERNOSTER, Giovanni (FBK); NEMALLAPUDI, Mythra Varun (CERN); LECOQ, Paul Rene Michel

Presenter: GUNDACKER, Stefan (CERN)

Session Classification: Medical Applications

Track Classification: Medical Applications