Contribution ID: **116** Type: **Posters**

Signal shape of a PET detector based on LSO:Ce,Ca crystals and SiPM

Tuesday, 29 November 2011 15:12 (1 minute)

Time Of Flight PET is a promising technique that can improve the image quality of a PET scanner. A TOF PET
detector must be designed by optimizing its energy and time resolution. Several researches are being performed
to improve the time performances of the PET detectors. Recent studies demonstrate that LSO:Ce codoped with
Ca (LSO:Ce,Ca) shows an higher light output, a reduced decay times and better energy resolution compared to
the standard LSO:Ce. For what concerns the photodetectors, a valid alternative to photomultiplier tubes (PMT)
is represented by the Silicon PhotoMultipliers (SiPM). They show high gain at rather low operating bias, they are
inherently fast (the single photon timing resolution is of 60 ps) and insensitive to magnetic elds, making them
attractive for new development of PET like TOF-PET and hybrid PET-MRI imaging. For these reasons, a detector
based on SiPM coupled to an LSO:Ce,Ca could introduce several improvements with respect to the currently used
PET modules.
The denition of the most performing detector conguration requires a study of the shape of the current pulse
produced in response to an incident photon. The study aims to assess the overall performance of a PET detector
composed by a SiPM coupled to LSO:Ce,Ca and connected to a fast transimpedance amplier. A suitable electrical
model for the SiPM and the scintillator has been considered to estimate the best timing resolution achievable by
the detector. The model is useful to predict system characteristics like the time jitter of the signals evaluated at
dierent thresholds. Measurements have been performed to validate the model and to characterize the system in
terms of energy resolution, decay time of the crystal and timing performances.
1

Presenter: DE LUCA, Giulia (PI)

Session Classification: Poster Session: presentation of posters