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## Characterization of TOF-PET Detectors Based on Monolithic Blocks and an ASIC-Readout

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The aim of this work is to show the potential capabilities of monolithic crystals, coupled to large SiPM arrays to be considered as detector blocks for TOF-PET scanners. Monolithic blocks allow one to decode the 3D photon impact position. This approach, along with TOF capabilities, can be of high interest in clinical PET applications where a typical ring configuration is not used.

In this manuscript, we evaluate an ASIC based readout for digitizing all signals coming from analog photo-sensors. Validation results with one-to-one coupling resulted in a CTR as good as 200 ps FWHM.

Providing timing resolution when using detectors based on monolithic is however challenging. The wide distribution of scintillation light causes a poor SNR, which makes the system sensible to false triggering and to time walk errors. In this direction, we present a calibration method, designed to correct all recorded timestamps and also to compensate variations in time-paths among channels. Thereafter, a CTR improvement nearing 35% is observed for all measurements. Moreover, we show a novel approach which describes the use of weighted averaging methods to assign the timestamp to each gamma impact. This approach results in a further improvement of the CTR in the range of 100 ps FWHM, reaching a time resolution of 850 ps FWHM using large 50x50x10 mm scintillators coupled to 8x8 SiPM (6x6 mm<sup>2</sup>) arrays. These pilot studies show detector capabilities regarding TOF information when using monolithic scintillators.

### Minioral

Yes

### Description

ASIC HW

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