Contribution ID: **39** Type: **Poster**

Digital signal processing for thermal neutron detectors using ZnS(Ag):6LiF scintillating layers read out with WLS fibers and SiPMs

Thursday, 28 May 2015 17:54 (0 minutes)

This work presents the development of a digital signal processing system for a thermal neutron detector designed for a strain-scanning diffractometer [1]. The detector is based on ZnS(Ag):6LiF scintillating layers read out with WLS fibers and SiPMs.
The main challenges concerning the signal processing are the suppression of the detector background counts due to the SiPM dark count rate and the suppression of the multiple triggers due to the scintillator afterglow, together with a high trigger efficiency and a high neutron rate capability.
The output of the SiPM is digitized so that each single photoelectron signal produces a 5ns wide NIM logical pulse. This digitization allows to get rid of the SiPM crosstalk since a simultaneous firing of several SiPM cells always leads to a single logical pulse. The impact of this digitization on the reduction of the background rate of the detector will be presented.
The digital signal processing system continuously counts the number of digital pulses during each FPGA clock cycle, i.e., it performs a sampling of the density of digital pulses in time. In this work, several digital filters are investigated and for each filter, the following detector characteristics are evaluated: background rate, trigger efficiency, probability of multiple triggers, neutron rate capability and time resolution.

[1] J.-B. Mosset et al., Nucl. Instr. and Meth. A, 764, 299 (2014).

Primary author: Dr MOSSET, Jean-Baptiste (Paul Scherrer Institute)

Co-authors: Dr STOYKOV, Alexey (Paul Scherrer Institute); Dr HILDEBRANDT, Malte (Paul Scherrer Institut); Dr SCHLUMPF, Niklaus (Paul Scherrer Institute); Dr GREUTER, Urs (Paul Scherrer Institute)

Presenter: Dr MOSSET, Jean-Baptiste (Paul Scherrer Institute)

Session Classification: Front end, Trigger, DAQ and Data Management - Poster Session

Track Classification: S5 - Front End, Trigger, DAQ and Data Management