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Gamma-Neutron discrimination

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The problem to discriminate between gamma-rays and neutrons is a long standing one and it was faced in the past using Time of Flight or PSD techniques as the charge difference technique.

The CLYC (Cs2LiYCl6:Ce) scintillator can easily discriminate between gamma-rays and neutrons induced events but, unfortunately, it has a too low density (only 3.3 g/cm3) and the decay time constant of the scintillation light is too long (the longest is approximately 1000 ns).

Such a long lifetime for the scintillation light makes the crystal unable to sustain high count rates and, in addition, its low density reduces the total full energy peak efficiency making the CLYC crystal not optimal when high efficiency and high counts rates are essential.

The detection and the identification of fast neutrons is performed in CLYC using the nuclear interactions of a neutron with 35Cl (a stable isotope of Cl).
Therefore, a good starting point could be the scintillators which contain 35Cl namely, LaCl3 and CLLBC.

The basic idea is to perform some kind of PSD algorithm or to use (as was already performed in some papers) the FFT and then some kind of PSA on the FFT transformed detector signal to identify neutron events from gamma-ray induced one.

In this presentation, I'll present the status of the research we are performing in Milano on this topic.

Author: CAMERA, Franco Ersilio (University of Milano, department of Physics, via Celoria 16 Milano, 20133 Italia and I.N.F.N. Milano section)

Presenter: CAMERA, Franco Ersilio (University of Milano, department of Physics, via Celoria 16 Milano, 20133 Italia and I.N.F.N. Milano section)

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