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CLYC: a new scintillator detector for nuclear physics

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The R&D work on new scintillator materials produced several high performing scintillators with an energy resolution better than that of NaI (6-7% at 662 keV).

The best known is LaBr₃:Ce because of its excellent and unmatched properties in term of energy (3 % at 662 keV), time (< 500 ps) resolution and efficiency (density of 5.1 g/cm³) for gamma ray detection. However, very new materials as CLYC, CLLB, CLLBC, Co-Doped LaBr₃:Ce are appearing together with the new but better known scintillators as SrI₂:Eu and CeBr₃:Ce. These detectors could compete with LaBr₃:Ce and, in general, outclasses NaI in terms of performances.

The Cs₂LiYCl₆:Ce (CLYC) scintillator, that belong to the Elpasolite family, is an interesting scintillator for its capability to measure and discriminate gamma rays and neutrons simultaneously with excellent resolution. A CLYC scintillator can measure thermal neutrons , (if ⁶Li is used) but it can be used as a clean fast neutron spectrometer (if ⁷Li is used), due to ³⁵Cl ions. We have tested the properties of i) two 1" x 1" CLYC scintillators (one enriched with ⁶Li and one enriched with ⁷Li) using either standard γ and neutron sources and monochromatic neutrons beams ii) a 2"x2" CLYC scintillators (enriched with ⁷Li) and iii) we will test a 3"x3" (enriched with ⁷Li) CLYC crystal. Here we will present some results of the measurements

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