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UCN detection with 6Li doped glass scintillators

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Precision experiments at the high intensity UCN sources of new generation either planned or under construction around the world, call for the development of new UCN detectors with higher counting rate capabilities. In this context, several studies including solid state semiconductors, gas detectors as well as scintillator detectors, have recently been reported [1-4]. For the nEDM experiment at PSI, we have developed fast detectors based on 6Li doped glass scintillators (GS).

A novel detector, made of a 6Li depleted GS30 glass stuck to the front of a 6Li enriched GS20 glass, has been tested. With such a combination, the edge effects, inherent to low energy neutron detection, are suppressed. As a result, a clear separation between the gamma and the neutron contributions is observed. The rate capability of the GS scintillators is in order of a few 10⁵ UCN/s limited by the photomultiplier. In order to be able to count up to a few 10⁶ UCN/s, a multidetector made of nine channels has been carried out. A new FASTER acquisition system has been developed to handle such high counting rates. The first tests performed at the ILL PF2/TEST beam line with the whole system are successful and are reported here.

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