A NEW LOW-ENERGY NEUTRON DETECTOR FOR (P,N) EXPERIMENTS WITH PULSE SHAPE DISCRIMINATION PROPERTIES

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Experimental devices at radioactive beam factories have to be able to handle the higher beam intensity and provide good detection efficiency at the same time. Based on this motivation, we are designing a new neutron detector system for (p,n) charge-exchange experiments in inverse kinematics. There are existing spectrometers for this purpose such the WINDS [1] at RIKEN or LENDA [2] at NSCL, MSU or ELENS [3] at ATOMKI but these devices are not able to perform pulse shape discrimination. The capability of neutron and gamma discrimination of low-energy neutron detectors is very important: to remove the gamma background already in hardware level.

As an upgrade of WINDS detector we construct a system consisting from thin and long plastic bars with photomultiplier tubes mounted on each end. This instrument will be capable of neutron and gamma ray pulse shape discrimination using new advances in plastic scintillation compositions (EJ-299-34).

The prototype detector bar has already been designed and prepared. The read out electronics of upgraded modules is based on Mesytec MPD-4 pulse shape discriminator module. The properties of detector (efficiency, position resolution, time resolution) as well as the pulse shape discrimination capability will be presented.

This detector will be a part of experimental setup of SAMURAI 30 experiment. We will investigate the isovector response of 11Li and 14Be nuclei near the neutron drip line. An experimental approach to study the variation of the spin-isospin collectivity is the energy difference between the Gamow-Teller giant resonance (GTGR) and isobaric analog state (IAS) as a function of (N-Z)/A. The motivation and status of experimental preparation will be presented also.

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