**New approaches to neutron monitoring in low background neutrino experiments**

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In this work the new methods for neutron detection in low background experiments are presented.

During study of background conditions of νGeN[1] and Ricochet[2] neutrino experiments is has been shown that low intrinsic background helium-3 filled tubes are suitable not only for well known detection of thermal neutrons, but also for the fast neutrons with energies up to few MeV. Data obtained with the detectors at the above mentioned neutrino sites were compared with results of ambient neutron flux measurements at Dubna.

Alternative to the 3He could be NaI (Li+Tl) [3] detectors. One such of the detectors loaded with 1% of natLi was experimentally studied. Its properties and response were measured. In the study, a high intrinsic background of the detector was revealed. This background results in significant uncertainty with identification of neutrons, especially for measurements designated for the fluxes at the level below 10-3 n cm-2 s-1. Nevertheless, the MC calculations based on our data shows that in a case of the detector loaded with 2% of 6Li and with its background reduced to the lowest values of available NaI detectors, it will becomes possible simultaneous measurement of low level fluxes for thermal (by the reaction on 6Li), epithermal (by the method proposed in[4]) and fast neutrons [5]. That possibility, together with traditional γ– measurements, looks very promising for background characterization at neutrino experiment sites.

1. V. Belov et al., JINST, 10, P12011 (2015).

2. G. Beaulieu et al., <https://arxiv.org/abs/2111.06745> (2021).

3. Saint-Gobain NaIL Detectors, <https://www.crystals.saint-gobain.com/radiation-detection-scintillators/crystal-scintillators/nail-scintillation-crystals>.

4. E. Yakushev et al., Nucl. Instrum. Meth. A, 848, 162 (2017).

5. D. Ponomarev et al., JINST, 16, P1201 (2021).