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Measurements of ambient thermal neutrons with modern lithium containing scintillation detectors

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For all stages of low-background experiments starting from concept of the shields, modeling as well during the operation comprehensive knowledge of gamma and neutron ambient backgrounds at the experimental sites is between of the most important tasks. Many various types of detectors are usually applied for experimental studies and monitoring of these backgrounds. In general completely different detectors serve for neutron and a gamma-ray measurements. Each of the detectors is required own acquisition chain, data analysis and a place for installation which is always limited in tighten conditions of low background underground laboratories. Therefore, for optimization of experiments the use of a detector, which can measure both the neutron and gamma background simultaneously, is very promising. One of these detectors are lithium-6 containing scintillators. Some of the modern types of such detectors are inorganic crystals CLYC (Cs2LiYCl6: Ce) and CLLB (Cs2LiLaBr6: Ce). Detectors based on these scintillators have a high energy resolution on gamma lines (~ 4% FWHM on Cs-137 662 keV line), moreover such detectors provide the separation of neutrons and gammas by pulse shape discrimination (PSD). This work presents first measurements of ambient neutron and gamma backgrounds performed in JINR with these detectors. Detectors' response (energy resolution and stability, efficiency, PSD capability, etc), to gamma and neutrons has been determined. Own gamma background of the detectors and their contamination by alpha isotopes in neutron detection region was investigated. Thus, the possibility of using such detectors in low-background experiments with low neutron flux was evaluated.

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