

Fast and thermal neutron scattering and absorption by structural materials of neutron detectors

Saturday, 25 September 2021 15:40 (25 minutes)

It is important to choose structural materials for its parts when creating neutron detector. We demonstrate advantages of gas detector over other detector types and we consider advantages and disadvantages of isotopes ^3He , ^7Li and ^{10}B as converting. Difference between the operation of gas-filled detectors and detectors based on solid layer is also considered. Scattering of neutrons distortion measured neutron field and their flux from source. Activation of nuclei by structural materials, in particular, metals, leads to detector excitation in the absence of neutrons. Neutron absorption reduces their flux.

We propose the using of aluminum and silicon as structural materials. We propose the using glass and ceramic based on Al_2O_3 as insulators. They have a small scattering, absorption and activation cross-section and do not give long-lived isotopes. The converter choice of ^3He , ^7Li or ^{10}B is determined by neutron energy range and background conditions of gamma quanta and other particles.

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Session Classification: Section 3. Modern nuclear physics methods and technologies

Track Classification: Section 3. Modern nuclear physics methods and technologies.