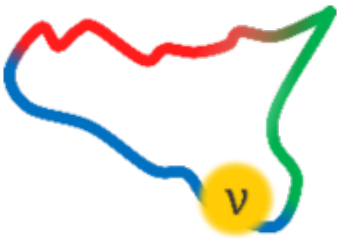

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Characterization and simulation of the low background GAGG neutron detector

A precise measurement of neutron flux is crucial for underground experiments, as neutrons may cause significant background for rare events searches. Due to the high neutron capture cross-section of the gadolinium isotopes present in cerium-doped $Gd_3Al_2Ga_3O_{12}$ (GAGG) crystal, combined with the high attenuation coefficient for efficient detection of neutron-induced γ rays, the GAGG scintillating crystal has the potential to show a clean signature for detecting neutrons. Furthermore, it features an excellent property of pulse shape discrimination that allows to distinguish signal-like events and backgrounds.
A prototype neutron detector has been assembled using a 100 cm^3 GAGG crystal coupled to a photomultiplier tube. It is operated in the Gran Sasso underground laboratory, aiming to detect high energy γ rays as the signal signature. This work presents the detector characterizations, regarding its performance and capabilities for particle identification, as well as intrinsic background. The neutron response measured underground will also be shown. In order to verify and optimize the setup, Monte Carlo simulations are performed, and the preliminary results will be discussed.

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