

A mobile neutron spectrometer for the LNGS underground laboratory

Wednesday 29 March 2023 19:11 (1 minute)

Environmental neutrons are a source of background for various rare event searches (e.g., dark matter direct detection and neutrinoless double beta decay experiments) taking place in deep underground laboratories. The overwhelming majority of these neutrons are produced in the cavern walls by means of intrinsic radioactivity of the rock and concrete. Their flux and spectrum depend on location. Precise knowledge of this background is necessary to devise shielding and veto mechanisms, improving the sensitivity of the neutron-susceptible underground experiments.

Ambient neutrons have been measured previously at different locations of the underground laboratory LNGS in Italy. However, flux numbers vary considerably across the measurements and direct comparison between them is difficult owing to the use of different detector technologies and setups, each of which possesses characteristic systematics and energy windows. A project was launched to solve these issues and enhance the scientific infrastructure of LNGS.

We present the design and the expected performance of a portable neutron detector based on capture-gated spectroscopy as well as first test measurements and give an outlook towards the deployment at LNGS. This project is funded by the German Federal Ministry of Education and Research (BMBF) under the grant number 05A21VK1.

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Session Classification: Reception and Poster Session in the same room