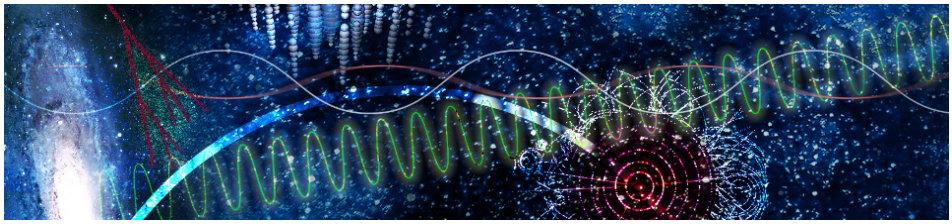

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Design of a mobile neutron spectrometer for the Laboratori Nazionali del Gran Sasso (LNGS)

Environmental neutrons are a source of background for rare event searches taking place in underground laboratories. The production of neutrons at LNGS is mainly driven by spontaneous radioactivity of the U and Th decay chains. The neutron spectrum is known to have spatial and temporal dependences: previous measurements show that the rock in Hall C produces 10 times more neutrons that in Hall A at LNGS and seasonal variations are expected.
We present a novel detector design concept, comprising of a mobile neutron detector made by stack of scintillators wrapped by gadolinium foils, which provide neutron-gamma discrimination. Extensive studies have shown that the detector will be capable of measuring a flux of the order of 10^{-6} n/cm^2/s, with a ambient gamma flux about 6 order of magnitudes larger.
Here we will present the design and the first steps on the construction and calibration of the detector, before the measurement of the neutron flux begins in 2024.

Author: POMPA, Francesco

Presenter: POMPA, Francesco

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