

GEANT4 simulation of muon capture on Fe, Al, Cu and BaCO₃ targets in the MONUMENT experiment

Monday 27 October 2025 18:30 (20 minutes)

The MONUMENT experiment is aimed at measuring muon capture on daughter nuclei of candidates for double neutrinoless beta decay ($0\nu2\beta$). These measurements will be important for verifying the accuracy of theoretical calculations of nuclear matrix elements.

Currently, there are a number of fundamental problems in physics, one of which is to determine the nature of neutrinos. $0\nu2\beta$ is possible only if the neutrino has a nonzero mass and if it is identical to its antiparticle. It is known that the rate of the $0\nu2\beta$ -decay reaction is influenced not only by the mass of the neutrino, but also by the size of the nuclear matrix element. Conventional muon capture is suitable for studying these important double beta decay processes.

This paper presents the results of modeling a muon trigger system consisting of C0, C1, C2, and C3 scintillation counters with targets of Fe, Al, Cu, and BaCO₃. The lifetime of muons in the target material and the efficiency of the trigger system are analyzed. The dependence of the target thickness for capture is calculated, which makes it possible to determine the optimal detector parameters. The data obtained form the basis for selecting a target in the experiment, ensuring reproducibility and interpretability of future measurements.

Author: BYSTRYAKOV, Artem (JINR, Dubna University)

Co-authors: ZINATULINA, Dania (JINR); VASILIEV, Sergey (JINR)

Presenter: BYSTRYAKOV, Artem (JINR, Dubna University)

Session Classification: Poster session & Welcome drinks

Track Classification: Instruments and Methods of Experimental Physics