ICHEP 2022 BOLOGNA

ICHEP 2022 XLI
International Conference on High Energy Physics
Bologna (Italy)

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13 07 2022

Contribution ID: **25**   Type: **Poster**

A Geant4-based simulation study for a preliminary setup of the MUonE experiment

Friday, 8 July 2022 20:10 (20 minutes)

MUonE is a proposed experiment which aims at an independent and precise determination of the muon $g - 2$, based on the measurement of the hadronic contribution to the running of the electromagnetic coupling constant in the space-like region. This can be achieved by measuring with extremely high accuracy the shape of the differential cross section of the μe elastic scattering, using a 160 GeV muon beam available at CERN, off atomic electrons of a light graphite target. Geant4 simulations are required in order to predict the level of noise which will be present in the proposed experiment. For this reason, a preliminary version of the final MUonE setup has been simulated with Geant4 10.7, the latest version containing relevant updated settings. This is the recommended version for the study of MUonE due to its correct estimation of the angular distribution of the e+e- production from muon interactions in the graphite material. In this talk, two related studies utilizing the Geant4 *emstandard_opt4* physics list will be presented, one involving direct standalone tests and another one employing simulation and reconstruction using the new FairRoot release with a Geant4 implementation. In both cases, the Geant4 10.7 version has been compared to older versions in terms of energy distributions and angular correlations. Finally, prospects for the comparison of the simulation with the results of future beam tests and test runs will be discussed.

In-person participation

Yes

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Session Classification: Poster Session

Track Classification: Detectors for Future Facilities, R&D, novel techniques