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NEWCUT: a novel tool for reconstruction of low-energy muon spectra

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High-precision muographic imaging of targets with thicknesses up to a few meters requires the accurate measurement of the angular and energy dependent flux of cosmic-ray muons in the low-energy regime (up to a few GeV). We designed a muon spectrometer, called NEWCUT [1]. It is a six-meter-length tracking system consists of nineteen Multi-wire Proportional Chambers (MWPCs) and lead plates. The rotatable support structure allows to tracking the charged particle between the horizontal and vertical directions. A machine learning-assisted muon energy classifier was implemented and trained using coordinate and energy deposit data simulated on chamber-by-chamber in GEANT4 framework. The comparison of simulated and reconstructed muon spectra suggest that the actual arrangement of NEWCUT is applicable to measure the muon spectra up to an energy of 6 GeV. The data analysis methods and first experimental results will be discussed.

[1] Oláh et al. Development of Machine Learning-Assisted Spectra Analyzer for the NEWCUT Muon Spectrometer, Journal of Advanced Instrumentation in Science, vol. 2022, https://doi.org/10.31526/jais.2022.264 (2022).

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