The MUonE experiment: Trigger and event selection

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Abstract

The **MUonE experiment** at CERN aims to determine the leading-order hadronic contribution to the muon $(g-2)$ through an innovative approach based on the elastic scattering of 160 GeV muons on atomic electrons in a low-Z target. The M2 beam line at CERN provides the required intensity to achieve the statistical goal within a few years of data taking. The main experimental challenge lies in the precise control of systematic effects. One of the critical aspects of the MUonE data analysis is the accurate identification of elastic scattering signal events while effectively rejecting background processes.

A first test run with a minimal prototype setup was carried out in 2023 using a triggerless readout system. The initial analyses focused on offline rejection of non-valuable events by analyzing the particle hit patterns recorded in the silicon detector, providing the basis for an efficient online trigger algorithm. In addition, precise particle identification and event classification were performed. The developed techniques were validated using Monte Carlo simulated data and subsequently applied to real data.

n 2025, a pilot run was conducted with a reduced configuration of the full detector setup, allowing for the first application and validation of the online trigger system. We will present the current status of the experiment, preliminary results, and future plans.