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Investigating Proton-Proton Elastic Scattering with the Upgraded HADES Spectrometer

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An experiment focused on hyperon production was carried out in 2022 with the upgraded HADES spectrometer. The upgrade includes a new Forward Detector system (FD) consisting of two PANDA-type Straw Tracking Stations, and an RPC. The measurements were performed with a $T = 4.5$ GeV proton beam impinging onto a LH_2 target.

Proton-proton elastic scattering events were selected based on kinematic observables, and demanding that one proton was detected in the FD ($\theta_{FD} < 6^\circ$), and the other proton was measured in the main HADES acceptance ($70^\circ < \theta_H < 79^\circ$). The number of elastic events, corrected for acceptance and reconstruction efficiency, determines the time-integrated luminosity recorded during this experiment. The measured differential cross-section $d\sigma$ as a function of the square of the 4-momentum transfer t is well described by a function of the form $d\sigma/dt = Ae^{-B|t|}$, from which the optical point $A = d\sigma/dt|_{t=0}$ and the nuclear slope parameter B are obtained. In this talk, the proton-proton elastic scattering event selection will be explained, and preliminary results of A and B will be presented and compared with existing data from other experiments.

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