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Luminosity Determination for the FAIR Phase-0 Beamtime to Study Hyperon Production with HADES

A production run focused on hyperon production was carried out in 2022 with the upgraded HADES Spectrometer, including the new Forward Detector components (FD). The measurements were performed with a proton beam of 4.5 GeV impinging onto a liquid hydrogen target. Proton-proton elastic scattering with one proton going in the FD ($\theta_{FD} < 6^\circ$) and the other proton into the main HADES acceptance ($70^\circ < \theta_H < 79^\circ$) has a high differential cross-section. These events were used to calibrate the FD and determine the integrated luminosity achieved during the production run. The event selection is based on the kinematic observables of this reaction. The integrated luminosity is calculated considering the elastics yield, the elastics scattering cross-section interpolated from measurements in other experiments, and a correction factor that accounts for the determined reconstruction efficiency in the FD. Preliminary results of the integrated luminosity for the beamtime will be presented.

Authors: PEREZ ANADRADE, Gabriela (Ruhr-Universität Bochum); RITMAN, James (FZ Juelich); WINTZ, Peter (Forschungszentrum Jülich (FZJ))

Presenter: PEREZ ANADRADE, Gabriela (Ruhr-Universität Bochum)

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