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Extraction of the luminosity at PANDA

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The high precision experiment PANDA is specifically designed to shed new light on the structure and properties of hadrons. PANDA is a fixed target antiproton proton experiment and will be part of Facility for Antiproton and Ion Research (FAIR) in Darmstadt, Germany. When measuring the total cross sections or determining the properties of intermediate states very precisely e.g. via the energy scan method, the precise determination of the luminosity is mandatory.

For this purpose, the PANDA luminosity detector will measure the 2D angular distribution of the elastically scattered antiproton trajectories. For the determination of the luminosity the parametrization of the differential cross section in dependence on the scattering angle is fitted to the measured angular distribution. The fit function is highly complex as it is not only able to correct for the detection efficiency and resolution, but also the antiproton beam shift, spotsize, tilt and divergence. As most of these parameters are extracted from the fit, this method is extremely powerful as it delivers also beam properties.
A sophisticated software package was developed to perform these extensive calculations, which is capable of extracting the luminosity with an accuracy in the permille level. The systematic uncertainties of the determination of the time-integrated luminosity are dominated by the elastic scattering model uncertainty and background contributions.
This talk will cover the complete luminosity determination procedure.

Secondary Keyword (Optional)

High performance computing

Primary Keyword (Mandatory)

Analysis tools and techniques

Tertiary Keyword (Optional)

Primary author: Mr PFLUEGER, Stefan (Helmholtz Institute Mainz)

Co-authors: MOTZKO, Christof (Helmholtz-Institut Mainz); FELDBAUER, Florian (H); LEITHOFF, Heinrich (Helmholtz Institute Mainz); FRITSCH, Miriam; MALDANER, Stephan (Johannes-Gutenberg-Universitaet Mainz (DE))

Presenters: Mr PFLUEGER, Stefan (Helmholtz Institute Mainz); PFLUEGER, Stefan

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