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Study of Excited Ξ Baryons in Antiproton-Proton Collisions with the PANDA Detector

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Understanding the excitation pattern of baryons is indispensable for a deep insight into the mechanism of non-perturbative QCD. Up to now only the nucleon excitation spectrum has been subject to systematic experimental studies while very little is known on excited states of double or triple strange baryons.

In studies of antiproton-proton collisions the PANDA experiment is well-suited for a comprehensive baryon spectroscopy program in the multi-strange and charm sector.

A large fraction of the inelastic $\bar{p}p$ cross section is associated to final states with a baryon-antibaryon pair together with additional mesons, giving access to excited states both in the baryon and the antibaryon sector.

In the present study we focus on excited Ξ states. For final states containing a $\Xi\bar{\Xi}$ pair cross sections up to the order of μb are expected, corresponding to production rates of $\sim 106/\text{d}$ at a Luminosity $L=1031\text{ cm}^{-2}\text{ s}^{-1}$ (5% of the full value).

A strategy to study the excitation spectrum of Ξ baryons in antiproton-proton collisions will be discussed. The reconstruction of reactions of the type $\bar{p}p \rightarrow \Xi^* \bar{\Xi}$ (and their charge conjugated) with the PANDA detector will be presented based on a specific exemplary reaction and decay channel.

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