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Investigation of the Σˆ0 production mechanism in p(3.5 GeV)+p collisions at HADES experiment

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The production of hyperons serves as a tool to investigate the strong interaction in the non-perturbative energy regime. While there are several experimental results for Λ hyperons in p+p reactions, measurements of the Σ^0 production are scarce. This talk presents a study of the Σ^0 production mechanism via the exclusive reaction $pp \rightarrow pK^+\Sigma^0$ at a beam energy 3.5 GeV with the HADES detector. The daughter Lambda hyperon $\Sigma^0 \rightarrow \Lambda\gamma$ (BR ≈ 100%) was reconstructed via the decay mode $\Lambda \rightarrow p\pi^-$ (BR ≈ 63.9\%) partly within the main HADES acceptance and partly within the forward wall acceptance. A kinematic refit was applied by constraining the secondary proton and the pion to the nominal Λ mass and the overall missing mass to the photon mass.

The dynamics of the reaction $pp \rightarrow pK^+\Sigma^0$ was investigated by studying the angular distributions in the CMS, Gottfried-Jackson and helicity frames. The angular distributions in the CMS frame supports the pion exchange mechanism. Furthermore, the helicity angular distributions are highly non-isotropic, which is a clear indication that there is a resonant component of the Σ^0 production. In order to provide a better description of the experimental angular distributions, the Bonn-Gatchina Partial Wave Analysis (Bo-Ga PWA) has been employed. However, due to the low statistics, it was not possible to obtain an unambiguous determination of the relative contribution of each intermediate nucleon resonance to the overall final state. Nevertheless, significant contributions of nucleon resonances $N^*(1710)$ (J^P=$1/2^+$), $N^*(1900)$ (J^P=$3/2^+$) and $^*(1900)$ (J^P=$1/2^-$) are preferred by the PWA fit.

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