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Production and electromagnetic structure studies of the Δ resonance in proton-proton collisions at 4.5 GeV with HADES

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Radiative transitions and decays of hadrons provide valuable information on their electromagnetic structure. The electromagnetic structure of the lowest lying excitation of the nucleon, the Δ resonance, remains of particular interest. This is accessible via radiative transitions such as $\Delta \rightarrow \Delta\gamma$ with real or, preferably, virtual photons . The first challenge is to understand the production mechanism of the Δ baryons in proton-proton collisions and the second challenge lies in the identification of (mostly) low-mass dilepton pairs. The High Acceptance Di-Electron Spectrometer (HADES) at GSI Darmstadt is a versatile magnetic spectrometer designed for measuring wide range of charged particle final states across large angular acceptance. It has excellent e^+/e^- reconstruction and is ideal for performing these studies. The main aim of this analysis is to extract differential cross-sections for the exclusive Δ channels in proton-proton collisions at 4.5 GeV, which will serve as a good basis for comparison to theory for understanding the internal structure through radiative transitions and can also be used as a reference for heavy ion reactions. This presentation will focus on the initial results of the analysis of proton-proton scattering data collected in February 2022 by the HADES collaboration with the ambition to extract valuable information on the production mechanisms of Δ resonances in exclusive reactions.

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