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Study of baryonic resonances and the ρ meson production in the reaction pp -> pp π^+ π^- at 3.5 GeV with HADES

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Two-pion production is a very rich inelastic channel in nucleon-nucleon collisions in the few energy range, as it carries unique information both on $\pi^+\pi^-$ dynamics and on single and double baryon excitation. Precise data are therefore crucial to improve the description of hadronic or nuclear collisions which is mostly based on one meson production channels. Two pion production channels have been measured in the past over a rather broad energy range. However only a few experiments have provided high statistics data, especially above the ρ meson production threshold.

The High Acceptance Di-Electron Spectrometer (HADES) [1] installed at GSI in Darmstadt, designed to investigate dielectron production in heavy-ion collisions in the range of kinetic beam energies 1-3 A GeV is also an excellent detector for charged hadron detection. Recently, differential and integrated cross sections for the reactions $pp \rightarrow pp\pi^0$, $pp \rightarrow pn\pi^+[2-4]$, $pp \rightarrow pp\pi^+\pi^-$, $pn \rightarrow pn\pi^+\pi^-[5]$, $pn \rightarrow d\pi^+\pi^-$ have been investigated with HADES at kinetic energies 1.25, 2.2 and 3.5 GeV.

This talk will focus on the analysis of the pp⟶pp π + π − channel at 3.5 GeV, using results from $pp \rightarrow pp\pi^0, pp \rightarrow pn\pi^+$ [3] and $pp \rightarrow pK\Lambda$ [6] measured at the same energy by HADES. A consistent description of the different channels is achieved and the contributions of the excitation of one or two baryonic resonances with masses up to 1.9 GeV has been quantified. In addition, using specific kinematical cuts, the total production cross section and angular distribution of the ρ meson were also extracted. The differential cross sections are compared to theoretical models [7-8] and the resonance contributions are confronted to the inputs of transport models used for the description of nuclear collisions.

The obtained results on single and double baryon resonance contributions as well as ρ production provide valuable constraints for the interpretation of the dielectron spectra measured by the HADES collaboration. Baryonic resonances and ⊠ mesons are indeed important sources of e+e- pairs which are strongly coupled according to the Vector Dominance Model.

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