

# Study of baryonic resonances in the reaction $pp \rightarrow pp\pi^+\pi^-$ at 3.5 GeV with HADES

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Pion production in NN collisions is one of the sources of information on the NN interaction and on the contribution of nucleon resonances. In particular, two-pion production in the few energy range, carries information both on  $\pi\pi$  dynamics and on single and double baryon excitation.

The High Acceptance Di-Electron Spectrometer (HADES) [1] installed at GSI Helmholtz-Zentrum für Schwerionenforschung 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, due to its tracking capabilities.

Recently, differential and integrated cross sections for the reactions  $pp \rightarrow pp\pi^0$ ,  $pp \rightarrow pn\pi^+$  [2-3-4],  $pp \rightarrow pp\pi^+\pi^-$ ,  $pn \rightarrow pn\pi^+\pi^-$  [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  $pp \rightarrow pp\pi^+\pi^-$  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. The contributions of the excitation on one or two baryonic resonances with masses up to 1.9 GeV and of the  $\rho$  production can be quantified. The results are compared with two theoretical models [7-8].

The results of this study provide strong constraints on the pion production mechanisms, and on the various resonance contributions ( $\Delta^0(1232)$ ,  $N^*(1440)$ , ...), as well as on the double resonance excitation and the direct  $\rho$  production. These aspects are closely related to the interpretation of the dielectron spectra measured by the HADES collaboration. Baryonic resonances are indeed important sources of dileptons through two mechanisms: the Dalitz decay (e.g.  $R \rightarrow Ne^+e^-$ ) and the mesonic decay with subsequent dielectron production.

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