

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

Tuesday 26 September 2017 20:45 (15 minutes)

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 ρ 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 ($\Delta^0(1232)$, $N^*(1440)$, \dots), as well as on the double resonance excitation and the direct ρ 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.

- [1] G. Agakishiev et al., Eur. Phys. J. A41, 243-277 (2009).
- [2] G. Agakishiev et al. Eur.Phys.J. A48 (2012) 74.
- [3] G. Agakishiev et al. Eur.Phys.J. A50 (2014) 82.
- [4] G. Agakishiev et al. , Eur.Phys.J. A51 (2015), 137.
- [5] G. Agakishiev et al., Phys.Lett. B750 (2015) 184.
- [6] G. Agakishiev et al. Phys.Lett. B742 (2015) 242-248.
- [7] A.P.Jerusalimov et al. Study of the Reaction $pn \rightarrow pn\pi^+\pi^-$ at Intermediate Energies. <http://arxiv.org/pdf/1102.1574.pdf>
- [8] X. Cao et al., Phys. Rev. C81, 065201 (2010).

Author: BELOUNNAS, Amel (IPN Orsay)

Presenter: BELOUNNAS, Amel (IPN Orsay)

Session Classification: Poster session

Track Classification: Hadron decays