The NN and NY interactions at small energies

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Recent results in nucleon-nucleon and nucleon-hyperon interaction at small relative energies will be discussed. The high resolution data on inclusive pion and kaon productions in the proton proton collision measured at COSY will be presented. The $pp \to \pi^+ + np$ and $pp \to K^+ + \Lambda p$ reactions were investigated using Final State Interaction methods.

An excellent description of the $pp \to \pi^+ + np$ data was obtained applying Watson theorem of FSI for the spin triplet state while no spin singlet could be found [1]. The ratio of the well known cross sections for $pp \to \pi^+ + d$ and new data for $pp \to \pi^+ + np$ reactions was investigated and compared with results of the Fäldt and Wilkin extrapolation theorem which relates np bound and scattering state in S-wave. However, bad description of this experimental ratio was found using Fäldt and Wilkin approach especially at energies above Δ resonance where production of bound deuteron is only roughly 50% of the pn continuum [2]. More precise three body calculations with tensor forces and S-D coupling still do not explain these differences.

The high resolution $pp \to K^+ + \Lambda p$ data together with previous total cross section data for free Λ p scattering were analyzed simultaneously using the Jost function approach [3]. The Λp singlet and triplet scattering length and effective range were deduced. Spin singlet and triplet contributions to the $pp \to K^+ + \Lambda p$ cross section will be discussed.

The total cross section for $pp \to K^+ + \Sigma^+ n$ reaction close to threshold was determined and it was found to be much smaller than a previous measurement in the same energy range. The data together with previous results at higher energies indicate that the energy dependence of the total cross section for $pp \to K^+ + \Sigma^+ n$ is compatible with a phase space dependence.

[1] The GEM Collaboration: M. Abdel Bary et al., Phys. Lett. B 610 (2005) 31.

[2] The GEM Collaboration: A. Budzanowski et al., Phys. Rev. C 79 (2009) 061001.

[3] The HIRES Collaboration: A. Budzanowski et al., Phys. Lett. B 687 (2010) 31.

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