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Pion production in diproton reactions with polarized beams at ANKE-COSY

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An experimental program to study near threshold pion production in the reactions $pp \rightarrow \{pp\}_s \pi^0$ and $pn \rightarrow \{pp\}_s \pi^+$, is undertaken at ANKE-COSY. The selection of the final proton pair $\{pp\}_s$ in the $1S0$ state, realized by cutting on the pair excitation energy $E_{\{pp\}} < 3$ MeV, simplifies the theoretical analysis of the processes. The combined study of these reactions is motivated by the extension of Chiral Perturbation Theory ChiPT to pion production in NN collisions. The measurement of $d\sigma/d\Omega$, A_y^p and the spin-correlation coefficients A_{xx} and A_{yy} will provide a non-trivial test of the ChiPT predictions, and lead to the isolation of the strength parameter d of the four-nucleon-pion contact interaction in ChiPT.

Use of the polarized COSY beam and the ANKE polarized internal target allows one to conduct single and double polarisation experiments. The results of the measurement of $d\sigma/d\Omega$, A_y^p in the two processes, carried out with the polarized proton beam, will be reported. The first analysis of the recent double polarized measurement of A_{xx} and A_{yy} in $pn \rightarrow \{pp\}_s \pi^+$, conducted with a polarized deuteron beam and a polarized hydrogen target, will also be presented.

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