CHARGE SYMMETRY BREAKING IN THE DD→AII^0 REACTION WITH WASA-AT-COSY

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If isospin symmetry was conserved, protons and neutrons would be treated equally by all types of interactions. Since up and down quarks, which are the constituent quarks of the proton and the neutron, have different charges and masses, isospin symmetry is not an exact one. It is broken both by electromagnetic and strong interactions.

Probing elementary symmetries and symmetry breaking tests our understanding of Quantum Chromodynamics. Investigations of charge symmetry breaking are one of the primary goals for the WASA-at-COSY experiment. The presented study concentrates on the charge symmetry forbidden dd→$\alpha\pi^0$ reaction. The aim is to provide experimental results for comparison with Chiral Perturbation Theory (χPT) predictions gaining information on the proton-neutron mass difference induced by the strong interaction.

First steps towards a theoretical understanding of the dd→$\alpha\pi^0$ reaction have already been taken. However, it was found that the existing data are not sufficient for a precise determination of the parameters of χPT and further data are required. These new data should comprise the measurement of the charge symmetry forbidden dd→$\alpha\pi^0$ reaction and the charge symmetry conserving dd→^{3}He$n\pi^0$ reaction at sufficiently high energy where *p*-wave contribution becomes important.

Results from a first measurement with the WASA detector setup at a beam momentum of 1.2 GeV/*c* had been already published, but the limited statistics did not allow a decisive interpretation. Thus, a second measurement using an improved detector setup aiming at higher statistics has been performed in spring 2014. The new results will be presented.