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## **Investigations of the charge symmetry conserving reaction $dd \rightarrow 3\text{He}\pi^0$ with WASA-at-COSY**

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Investigations of charge symmetry breaking become one of the most important topics for the WASA detector at COSY. One of the planned studies concentrates on the charge symmetry forbidden  $dd \rightarrow \alpha\pi^0$  reaction. Experimental results will be compared with Chiral Perturbation Theory (ChiPT) predictions gaining information on the up and down quarks mass difference.

First steps toward a theoretical understanding of the  $dd \rightarrow \alpha\pi^0$  reaction have been taken. It was found that the existing data are not sufficient for a precise determination of the parameters of the ChiPT and new data are required. These new data should comprise the measurement of the charge symmetry forbidden  $dd \rightarrow \alpha\pi^0$  reaction and the charge symmetry conserving

$dd \rightarrow 3\text{He}\pi^0$  reaction. The measurement of the second reaction is necessary in order to study the relevance of initial and final state interaction, which strongly influence the results for the  $dd \rightarrow \alpha\pi^0$  reaction.

Final experimental results of the investigation of the  $dd \rightarrow 3\text{He}\pi^0$  reaction at a beam momentum of 1.2 GeV/c will be presented. For the first time information on the total cross section and the differential distributions of this reaction were obtained. The total cross section was measured with an accuracy of about 11%. Various differential distributions exhibit a rich structures indicating important contributions of higher partial waves. The differential distributions are compared to theoretical expectations based on a phenomenological approach –the combination of a quasi-free model and a partial wave expansion model for the three-body reaction.

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