Anisotropy in the pion angular distribution of the reaction $pp \to pp\pi^0$ at 400 MeV

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The first high precision measurements of single neutral pion production in nucleon-nucleon collisions, using storage ring technology, were done more than a decade ago [1]. Still, the theoretical interpretation of the dominant production mechanism remains uncertain [2].

The data set for the reaction $\vec{p}\,\vec{p} \to pp\pi^0$ was drastically increased when all possible polarization observables were deduced in a kinematically complete experiment at beam energies between 325 and 400 MeV [3]. In spite of the experimental interest in the reaction $pp \to pp\pi^0$ during the last 15 years, the reports on the slope parameter b of the angular distributions [4] suffer somewhat from biassed acceptance and/or model dependence. The unpolarized differential π^0 cross section contains amplitudes that cannot be disentangled from the spin dependence. We have measured the unpolarized angular cross section of the π^0 at 400 MeV beam energy, with the aim to resolve some of the ambiguities and complement the polarized data. In the future the entire data set can be employed to form the basis of constraints in the study of the $pp \to pp\pi^0$ reaction using the Chiral Perturbation Theory approach that is under way [5].

The experiment was carried out at the WASA detector facility situated in the CELSIUS ring using a 400 MeV proton beam and a hydrogen pellet target. The center of mass angular distribution of the π^0 was obtained by detection of the γ decay products together with the two outgoing protons, and found to be anisotropic with a negative second derivative slope, in agreement with the theoretical predictions from a microscopic calculation [6]. Results from the analysis will be shown and comparisons with previous measurements will also be done.

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