Precision measurement of the η-meson mass at COSY-ANKE

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Measurements of the mass of the η-meson performed at different experimental facilities (i.e., COSY-GEM, MAMI, CLEO, KLOE, NA48) over the last decade have resulted in very precise data which differ by up to 0.5 MeV/c^2, i.e., more than eight standard deviations. In order to clarify this situation a new measurement of the $dp \to {}^3\mathrm{He}\,\eta$ reaction near threshold was proposed at the COoler SYnchrotron - COSY - of the Forschungszentrum Jülich with the aim to achieve a mass resolution of $\Delta m < 50$ keV/c^2.

Through the measurement of a set of twelve beam momenta p_d and associated ${}^3\mathrm{He}\,\eta$ final state momenta p_f a value for the η mass can be obtained on the basis of pure kinematics by the determination of the production threshold. The individual beam momenta were fixed with a relative precision of better than 10^{-4} at 3 GeV/c by using a polarized deuteron beam and inducing an artificial depolarizing resonance, which occurs at a well-defined frequency. The final-state momenta in the two-body $dp \to {}^3\mathrm{He}\,\eta$ reaction were investigated in detail by studying the size of the ^{3}He momentum ellipse in the focal plane of the ANKE spectrometer. The method for determination of the η mass as well as final results will be discussed in this presentation.

Supported by the COSY-FFE grants.

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