

Studying η -meson decays with WASA-at-COSY

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Collaboration

WASA-at-COSY

Abstract content

The η -meson is a unique tool in a way that it provides access to (rare) decay processes, which allow to probe symmetry breaking phenomena, determine transition form factors or to explore the anomalous sector of QCD.

In order to study those decay processes two data sets have been acquired with the WASA-at-COSY experiment at Forschungszentrum Juelich. A proton beam, provided by the COSY accelerator, is impinged on a liquid deuterium / hydrogen pellet target producing η -mesons via: $pd \rightarrow {}^3\text{He}\eta$ and $pp \rightarrow pp\eta$. The η -decay products as well as the forward-scattered projectiles are detected within the 4π WASA-at-COSY detector.

A first iteration of measurements was done using the $pd \rightarrow {}^3\text{He}\eta$ reaction for the study of the more abundant η -decay channels (such as $\eta \rightarrow \pi^+\pi^-\pi^0$) and to setup the framework for a common analysis. The rare η -decay modes (e.g. $\eta \rightarrow \pi^+\pi^-e^+e^-$) are studied by using the high-statistics $pp \rightarrow pp\eta$ data set.

The analyses of both data sets are dedicated to: The isospin violating decay $\eta \rightarrow \pi^+\pi^-\pi^0$; Exploring the box anomaly and dipion final state interactions via the radiative decay $\eta \rightarrow \pi^+\pi^-\gamma$; The determination of the electromagnetic transition form factor via the decays $\eta \rightarrow e^+e^-\gamma$ and $\eta \rightarrow e^+e^-e^+e^-$; Testing C- and CP-violation by studying $\eta \rightarrow \pi^0e^+e^-$ and $\eta \rightarrow \pi^+\pi^-e^+e^-$.

This talk will give an overview about the status of each analysis.

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