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Light Meson Decays at WASA-at-COSY

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The WASA-at-COSY experiment consists of a 4- π detector installed around an internal fixed target at the COSY storage ring at Forschungszentrum Jülich in Germany. A major component of the physics program is the study of decays of light mesons. Mesons are produced in proton-deuteron and proton-proton collisions at energies just above the production thresholds. The detector is capable of fully reconstructing all produced particles, including hadronic ejectiles and both charged and neutral meson decay products. This talk will focus on measurements of decays of the η based on a sample of 3×10^7 η mesons collected in the $pd \rightarrow {}^3He\eta$ reaction. The decays $\eta \rightarrow \pi^+\pi^-\gamma$ and $\eta \rightarrow \pi^+\pi^-e^+e^-$ allow probes of anomalous QCD. The measurement of the decay dynamics in the isospin-violating reaction $\eta \rightarrow \pi^+\pi^-\pi^0$ could pave the way for stricter experimental limits on the ratio of the light quark masses. The reaction $\eta \rightarrow e^+e^-\gamma$ provides information on the contribution of virtual vector mesons to the decay process, which can be quantified by measuring the electromagnetic transition form factor. Additionally, the high statistics of η mesons available allows observation of the rare process $\eta \rightarrow e^+e^-e^+e^-$. Results from the analyses of these channels will be presented. WASA-at-COSY has also collected over an order of magnitude more events in the $pp \rightarrow pp\eta$ reaction. This should enable greater sensitivity on physical observables in the rare decays. The analysis of this data is in progress. Additionally, data has been taken at different energies in order to study decays of the π^0 and ω mesons. An overview of these projects will be given.

¹For the WASA-at-COSY Collaboration