Study of the $\eta \to \gamma e^+ e^-$ decay with the WASA-at-COSY*

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In October 2008 WASA-at-COSY collaboration has collected more than 10^7 events for the $pd \to {}^3He\eta$ reaction. One of the aims of currently conducted analyses is the determination of the invariant mass of the lepton pairs created in the Dalitz decay $\eta \to \gamma e^+ e^-$. The shape of the $e^- e^-$ invariant mass spectrum is directly related to the distribution of the four-momentum squared of the virtual photon from the $\eta \to \gamma\gamma^*$ process and hence it allows for the study of the transition form factors which in turn reflects the spatial structure of the decaying meson. Experimentally we endeavor to determine the transition form factor as a function of the momentum transfer in the time-like region, in particular we intend to establish the form factor slope parameter for the $\eta \to \gamma e^+ e^-$ process and to compare the results with the predictions based on the Chiral Perturbation Theory as well as Vector-Meson Dominance and Quark-triangle Loop models. The experimental methods used, the current status of the analysis of the data, and the physics motivations for the study of the Dalitz decay of the eta meson will be presented and discussed.

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