Search for the η-mesic ^{4}He with WASA-at-COSY

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An exclusive measurement of the excitation functions for the $dd \to {}^3\mathrm{He}p\pi^-$ and for the $dd \to {}^3\mathrm{He}n\pi^0 \to {}^3\mathrm{He}n\gamma\gamma$ reactions was performed at the Cooler Synchrotron COSY-Jülich with the WASA-at-COSY detection system. The data were collected in two dedicated experiments in 2008 and in 2010.

The analysis of the 2008 data shows no signal of the ${}^4\mathrm{He}-\eta$ bound state in the excitation function. An upper limit for the cross-section for the bound state formation and decay in the process $dd \to ({}^4\mathrm{He}-\eta)_{bound} \to {}^3\mathrm{He}p\pi^-$, was determined on the 90 % confidence level.

During the experiment, in November 2010, two channels of the η-mesic helium decay were measured: $dd \to ({}^4\mathrm{He}\text{-}\eta)_{bound} \to {}^3\mathrm{He}p\pi^-$ and $dd \to ({}^4\mathrm{He}\text{-}\eta)_{bound} \to {}^3\mathrm{He}n\pi^0 \to {}^3\mathrm{He}n\gamma\gamma$. The collected statistics is about 40 times higher than in the previous measurement. The analysis of the 2010 data set is ongoing. The status of the research will be presented.

[1] P. Adlarson *et al.*, *Phys. Rev.* **C87**, 035204 (2013).

[2] M. Skurzok *et* al., *Prog. Part. Nucl. Phys.* **67**, 445 (2012).

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