Search for η-mesic Helium with the WASA-at-COSY detector.

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A search for the $^4\mathrm{He}-\eta$ bound state via exclusive measurement of the excitation function for the $dd \to {}^3\mathrm{He}p\pi^-$ reaction, was performed at the Cooler Synchrotron COSY-Juelich with the WASA-at-COSY detection system. The data were taken during a slow acceleration of the beam from 2.185 GeV/c to 2.400 GeV/c crossing the kinematic threshold for the η production in the $dd \to {}^4\mathrm{He}\,\eta$ reaction at 2.336 GeV/c. The corresponding excess energy in the $^4\mathrm{He}-\eta$ system varied from -51.4 MeV to 22 MeV. The integrated luminosity in the experiment was determined using the $dd \to {}^3\mathrm{He}n$ reaction and the relative normalization of the $dd \to {}^3\mathrm{He}p\pi^-$ excitation function was based on the quasi-elastic proton-proton scattering. No signal of the $^4\mathrm{He}-\eta$ bound state was observed 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. The results of the analysis will be presented.

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