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Study of the neutron-rich hydrogen isotope $^{6}\mathrm{H}$ in electron scattering experiment at MAMI-A1

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The neutron-rich isotopes of hydrogen, such as ^{6}H and ^{7}H, are good platforms for the study of NN interactions in neutron-rich environments because they have the largest neutron-to-proton ratios known so far. However, the experimental and theoretical studies of them are still limited. For ^{6}H, the energy of its ground state is still controversial. It is about 2.7 MeV (above the ^{3}H+3n threshold) in some experiments but about 6.6 MeV in others. The actual location of the ^{6}H ground state remains an open problem in theoretical work as well.

To solve this puzzle, ^{6}H is studied for the first time in an electron scattering experiment with the reaction $^{7}\mathrm{Li}(\mathrm{e},\mathrm{e}'\mathrm{p}\pi^{+})^{6}\mathrm{H}$ at MAMI-A1. The 855 MeV electron beam of the Mainzer Microtron (MAMI) is used to hit a ^{7}Li target. The scattered electron, the produced proton, and π^{+} are measured by the three-spectrometer setup in the A1 hall. With the triple timing coincidence and momentum measurements of three spectrometers, the missing mass spectrum of ^{6}H can be obtained. In this talk, we will present the details of our experiment. The principle, setup, and data analysis of the experiment, including corrections and calibrations of the data, will be discussed. Our measurement of the ^{6}H ground state energy and its width will be shown and compared with previous measurements and theoretical calculations.

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