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A new study of ^{5}H

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We have studied the ground state of the extremely neutron-rich isotope of hydrogen, ^{5}H, using the ^{6}He(d,^{3}He)^{5}H reaction in inverse kinematics. Several measurements exist for ^{5}H (see Ref. [1]), however different results are in conflict with each other and with many theoretical predictions. The present measurement provides a clear evidence for the ^{5}H ground state, and the previously unreported ^{6}He(d,t)^{5}He ground state reaction is observed in the same experiment. A ^{6}He beam at 55 AMeV produced at the National Superconducting Cyclotron Laboratory at Michigan State University bombarded a 1.9 mg/cm^{2} (CD_2)n target. The reaction products were detected with HiRA (the High Resolution Array) [2]. The properties of the ^{5}He ground state are well known from neutron scattering and the ^{4}He(d,p)^{5}He reaction and provide information about the calibration and response of the apparatus. The ^{3}He and ^{3}H particles from the ^{6}He(d,^{3}He/^{3}H)^{5}H/^{5}He reactions were detected in coincidence with the decay products of the unstable ^{5}H and ^{5}He nuclei, providing clean signatures for the transitions of interest. The data reveal clear evidence of the ^{5}H ground-state resonance at an energy of 2.4±0.4 MeV above the threshold for decay into t+2n, with a width of 4.4±0.4 MeV. Details of the measurement, and a comparison of the results with those of previous measurements and theoretical calculations, will be presented.

[1] L. V. Grigorenko, Eur. Phys. J. A 20, 419 (2004) and references therein.

[2] M. S. Wallace et al., Nucl. Instrum. and Meth. A 583, 302 (2007).

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