^{1}H(^{8}He,pp) 2003Ko11,2003Ko68

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	K. Setoodehnia, J. H. Kelley, J. E. Purcell	ENSDF	28-September-2023

2003Ko11, 2003Ko68: The experiment was performed in RIKEN using a ^{8}He beam produced from the fragmentation of a primary ^{18}O beam at the RIPS fragment separator. The ^{8}He beam bombarded a cryogenic hydrogen gas target filled with 10 atm of hydrogen at 35 K. The outgoing protons were detected by a stack of Si strip detectors and the tritons and neutrons from the breakup of ^{7}H were detected in a downstream detection system consisting of a dipole magnet and plastic scintillators. A kinematic reconstruction of the 2p momenta permitted a reconstruction of the ^{7}H excitation spectrum. A resonant state was found ~3 MeV above the ^{3}H+4n threshold (binding energy of ~5.4 MeV) superimposed over a large background. However poor center-of-mass energy resolution and the large statistical error bars did not allow to extract accurate information on the resonance energy and width. This is the first report of a resonant state in ^{7}H.

2020PoZY, 2021Hu28: A p(^{8}He, 2p)^{7}H(^{3}H+4n) experiment was performed at the RIBF facility of RIKEN. A 150 MeV/nucleon ^{8}He beam was produced via projectile fragmentation of a ^{18}O primary beam bombarding a ^{9}Be target. BigRIPS fragment separator was used to purify the ^{8}He beam (10^{5} pps). This beam impinged on MINOS, a 150 mm think liquid hydrogen target. The outgoing protons from the p(^{8}He, 2p) reaction were tracked by the Time Projection Chamber surrounding MINOS and were detected in coincidence by an array of 36 NaI crystals arranged in two symmetric rings around MINOS. The energy resolution of these scintillators was 1% (FWHM) at E_p=80 MeV. The tritons from the decay of ^{7}H were momentum analyzed by the SAMURAI dipole magnet. Its associated focal plane detectors measured the energy loss and time-of-flight of the tritons. Neutrons′ time-of-flight and positions were detected by two plastic scintillator arrays: the NeuLAND demonstrator from GSI and the NEBULA array, placed downstream of SAMURAI at θ=0°. These arrays together provide the highest 4n detection efficiency (~0.6% at decay energy of 1 MeV).

The experimenters estimate that 20% of the neutrons detected may come from multiple hits produced by the background neutrons. Ongoing analysis indicates that this experiment has access to the complete 7−body kinematics of the final state (2p+^{3}H+4n). Their preliminary analysis seems to suggest that ^{7}H decays via direct emission of a tetraneutron since the sequential decay through intermediate ^{4,5,6}H is energetically forbidden. The results of this experiment are not yet published.

^{7}H Levels

E(level)	J^{π}	Comments
0	$(1/2^{+})$	Γ=broad. J^{π}: from (2003Ko11, 2003Ko68).