^{2}H(^{12}B,p) 2010Ba06

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	J. H. Kelley, C. G. Sheu and J. E. Purcell	NDS 198,1 (2024)	1-Aug-2024

$J^{\pi}(^{12}B\ g.s.)=1^{+}$.

2010Ba06: XUNDL dataset compiled by TUNL, 2010.

A 75 MeV/nucleon beam of ^{12}B ions, produced by bombarding a cryogenic deuterium gas cell with ^{11}B ions at the ANL/ATLAS facility, impinged on a 73 μg/cm^2 CD_2 target located at the HELIOS (HELIcal Orbit Spectrometer) target position. Reaction protons were emitted in the backwards direction and followed a single helical orbit in the 1.05 T axial magnetic field before reaching a barrel shaped array of position sensitive Si detectors that surrounded the incident beam axis. The forward moving ^{13}C ions were stopped in a ΔE-E telescope that covered θ_{lab}=0.5°−2.8°.

The momentum of the emitted proton was determined and excited states were resolved with ΔE≈100 keV FWHM. The angular distribution for population of ^{13}B(3.48, 3.68 MeV) was determined over $\theta_{c.m.}$=8°−30° by analyzing the p+^{13}B coincidences. The angular distributions were analyzed via DWBA analysis.

2010Le02: XUNDL dataset compiled by TUNL, 2010.

A 75 MeV/nucleon beam of ^{12}B ions, from the ANL/ATLAS facility, impinged on a 150 μg/cm^2 CD_2 target. A set of three position-sensitive annular Si detectors measured protons at $\theta_{lab.}$=110°−161° while forward moving boron isotopes were identified in a ΔE-E telescope that covered θ_{lab}=1.3°−7.2°. Neutron bound and unbound states of ^{13}B were identified at E_x=0, 3.48, 3.68, 5.105, 5.388 MeV; only the ground state was resolved.

The angular distribution was determined for the ground state over $\theta_{c.m.}$=7.5°−30°, and it was analyzed via DWBA analysis to obtain spectroscopic data useful for determining the astrophysical ^{12}B(n,γ) reaction rates. Also see 2008WuZY, 2011BaZX for other ANL reports.

See (2021Du10) for a calculation of the cross section at astrophysically relevant energies.

^{13}B Levels

E(level)[†]	J^{π}[#]	L[#]	S[#]	Comments
0	$3/2^{-}$	1	1.1 *3*	
3.48×10^3[‡]	$(1/2^{+})$	0,2		$S_{L=2} \leq 0.05\ S_{L=0}$ component (2010Ba06).
3.68×10^3[‡]	$(5/2^{+},3/2^{+})$	2,0		The L=0 component is less than ≈2% of the L=0 component for the 3.48 MeV state. The authors suggest that $J^{\pi}=5/2^{+}$ is favored based on absence of L=0 component in the angular distribution and a better fit to the ratios of spectroscopic factor (2010Ba06).
5105[‡]				
5388[‡]				

[†] Nominal values given in (2010Ba06, 2010Le02).

[‡] Unresolved in (2010Le02).

[#] From DWBA analysis of spectroscopic factors in (2010Le02).