^{1}H(^{13}B,X) 2021Li64

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

2021Li64: XUNDL dataset compiled by TUNL (2022).

The authors determined the spectroscopic factors for ^{1}H(^{13}B,d) *s*-, *p*- and *d*-wave neutron transfer to low-lying ^{12}B states. Using these spectroscopic factors, they analyzed the intruder *s*- and *d*-wave strengths that comprise the ^{13}B ground state.

A beam of 23 MeV/nucleon ^{13}B ions from the RCNP/Osaka electromagnetic isotope separator impinged on a 6.76 mg/cm^2 polyethylene target that was rotated slightly by 20° with respect to the incident beam. The ^{12}B +*d* reaction products were momentum analyzed using a set of three 5 cm × 5 cm position sensitive ΔE-ΔE-E telescopes. The ^{12}B ejectiles were detected using the T0 telescope, which was centered along θ=0°; deuterons were detected by the T1 and T2 telescopes, which were centered on the horizontal plane at θ=−31° and θ=−70°, respectively. Lastly, a position sensitive Si annular detector was positioned at backward angles to detect protons from any ^{2}H(^{13}B,p) reactions.

Differential cross sections for ^{1}H(^{13}B,p) elastic scattering were obtained and evaluated via optical model analysis, while ^{1}H(^{13}B,d) reactions to ^{12}B states up to E_x=6.0 MeV were evaluated via DWBA using FRESCO to obtain the relative spectroscopic factors. For some higher-lying states, the ^{12}B ejectile neutron decayed to ^{11}B, which was detected and identified via ΔE-E in the T0 telescope. The dominant neutron transfer orbital from each state was analyzed to obtain the ^{13}B$_{g.s.}$ *s*-, *p*- and *d*-wave neutron strengths. The relevant contributions are given below. Values of 83% *6* *p*-wave, 5% *2* *s*-wave and 12% *2* *d*-wave were determined for ^{13}B$_{g.s.}$. Using these observations, the authors find consistency with shell model predictions and N=8 magicity in the ^{13}B nucleus.

See also (2013Ti05).

Levels in ^{12}B

Level Energy (keV)	L	neutron orbital	J^π	S_{rel}
0	1	$1p_{1/2}$	1^+	0.54 *5*
953	1	$1p_{1/2}$	2^+	1.11 *7*
1674	0	$2s_{1/2}$	2^-	0.06 *2*
2621	0	$2s_{1/2}$	1^-	0.04 *1*
3389	2	$1d_{5/2}$	3^-	0.13 *2*
4460&4523	2	$1d_{5/2}$	2^-&4^-	(Sum)=0.11 *2*
6000	2	$1d_{5/2}$	1^-	≤0.01

^{13}B Levels

E(level)	J^π	Comments
0	$3/2^-$	J^π: 83% *6* *p*-wave, 5% *2* *s*-wave and 12% *2* *d*-wave neutron strengths were deduced for ^{13}B$_{g.s.}$, which are consistent with shell model predictions and N=8 magicity in ^{13}B.