$^{11}B(^{3}He,n),^{11}B(^{3}He,n\gamma)$

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

1966Di04: $^{11}B(^{3}He,n_0)$ E=1.5-5.5 MeV; measured $\sigma(E,\theta)$ for $\theta\approx0°$ to 170°.
1966Ch18: $^{11}B(^{3}He,n\gamma)$ E=1.23-2.00 MeV; measured n-p, n-γ coincidences. Explained erronious identification of $^{13}C^*$(6.27,5.56) states.
1968Co27: $^{11}B(^{3}He,n\gamma)$ E=7.3 MeV; measured decay modes of $^{13}N^*$(15.07 MeV). Analyzed E_γ, I_γ, pγ-, nγ-coincidences. Deduced level energy, γ, IAS γ decay. Deduced $\Gamma_{\gamma0}/\Gamma_{p0}$=0.12 *2* from; when combined with $\Gamma_p\Gamma_{\gamma0}/\Gamma$ from (1968Di04) and Γ_{p0}/Γ from (1967AdZY) this gives $\Gamma_{\gamma0}/\Gamma$=0.024 *5* and Γ=1.13 keV *3*. Reviewed other IAS decay branches.
1969Ad01,1969Ad02: $^{11}B(^{3}He,n)$ E=7-13.5 MeV, measured $\sigma(E_n,\theta)$. Deduced level energies, T, Γ, J, π, L, discussed T=3/2 states (1969Ad02). Found Γ_{p0}/Γ=0.202 *20* and Γ_{p1}/Γ=0.121 *15* (1969Ad01). When combined with results from (1968Di04, 1969Le18,1968Co27) this implies Γ=1.17 keV *12*, $\Gamma_{\gamma0}$=27 keV *5*, Γ_{p0}=0.24 keV *5* and Γ_{p1}=0.14 keV *3*.
1971Hs03: $^{11}B(^{3}He,n)$ E=4.7, 6.1, 6.49 MeV; measured $\sigma(E,E_n,\theta)$ for θ=0° to 150°. Deduced Q-value to levels, level energies, L, J, Γ.
1973Ad02: $^{11}B(^{3}He,n)$ E=7.0 MeV; detected neutrons and decay protons from $^{13}N^*$(15.07) to ^{12}C(0,4.4,7.65). Deduced Γ_p/Γ and Γ_α/Γ branching ratios and partial widths. Referenced E_x=15.066 MeV *4* from the (1968Ce01) review.
1975Ma21: $^{11}B(^{3}He,n\gamma)$; measured pγ-, nγ-coincidences with θ_γ=125° and θ_n=0°. For $^{13}N^*$(15.07) deduced $\Gamma_p\Gamma_{\gamma0}/\Gamma$=5.79 eV *20* from $^{12}C(p,\gamma)$ measurements. They combine results with (1973Ad02) to obtain $\Gamma_{\gamma0}$=24.5 eV *15*. Using the E2/M1 intensity ratio they measured (=0.013 *5*) they found Γγ0(M1)=24.2 eV *15* and Γγ0(E2)=0.32 eV *12*. They determined relative transition strengths for γ_0, γ_1 and γ_2. Lastly, they discussed $^{13}C/^{13}N$ isotensor asymmetries.
1977Da18: $^{11}B(^{3}He,n_0)$ E=5-12 MeV; measured $\sigma(E,E_n,\theta)$.
1977Ma16: $^{11}B(^{3}He,n\gamma)$ E=7.0 MeV; measured nγ-coincidence. θ_γ=125°. Deduced $\Gamma_{\gamma0}/\Gamma_{p0}$=0.121 *11*. Combined their results with others to find Γ=0.86 keV *12*.
1977Os08: $^{11}B(^{3}He,n)$ E=1.7, 1.9 MeV; analyzed 2-p stripping reactions and spectroscopic factors.
1979Os10: $^{11}B(^{3}He,n_0)$ E=0.9-1.9 MeV; measured $\sigma(\theta)$. deduced S using different models.

^{13}N Levels

E(level)†	J$^\pi$†	Γ	L†	Comments
0	1/2⁻		2	
2358 *10*	1/2⁺		1	
3502 *10*	3/2⁻		0+2	
3550 *18*				
6353 *9*	5/2⁺		1+3	
6875 *10*	3/2⁺		1+3	
7145 *9*	7/2⁺		3+5	
7363 *8*	5/2⁻		2+4	
8200 *22*				
8918 *11*				
9476 *8*	3/2⁻		0+2	E(level): See also E_x=9.52 MeV 2 (1966Ch18).
10381 *8*	5/2⁻		2+4	E(level): See also E_x=10.35 MeV 2 (1966Ch18).
10833 *9*				
11530 *12*				
11878 *12*	3/2⁻		0+2	
12558 *23*		>400 keV		Γ: From (1971Hs03).
12937 *24*		>400 keV		Γ: From (1971Hs03).
15068 *8*	3/2⁻	<15 keV	0	T=3/2 E(level),Γ,J$^\pi$,L: and T from (1969Ad02). (1968Co27): $\Gamma_{\gamma0}/\Gamma_{p0}$=0.12 *2*. (1969Ad02): Γ<15 keV; Γ_{p0}/Γ=0.202 *20* and Γ_{p1}/Γ=0.121 *15* from (1969Ad01). (1973Ad02) Measured Branching ratios to ^{12}C and ^{9}B states. Assuming Γ=0.82 keV *20* from (1973Ad02,1968Co27,1968Di04), ^{12}C(0)=23.6% *12* and Γ_{p0}=0.19 keV *5*, ^{12}C(4.44)=15.0% *10* and Γ_{p1}=0.12 keV *3*, ^{12}C(7.65)=5.3% *15* and Γ_{p2}=0.043 keV *16*, ^{9}B(0)=4.9% *27* and $\Gamma_{\alpha0}$=0.040 keV *24*, ^{9}B(1.6)=3.9% *39* and $\Gamma_{\alpha1}$=0.032 keV

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$^{11}B(^{3}He,n),^{11}B(^{3}He,n\gamma)$ (continued)

^{13}N Levels (continued)

E(level)†	Γ	Comments
		32, $^{9}B(2.36)$=7.2% *45* and $\Gamma_{\alpha2}$=0.059 keV *40*, $\Gamma_{\gamma0}$=23.3 eV *36*. (1975Ma21):$\Gamma_p\Gamma_{\gamma0}/\Gamma$=5.79 eV *20* and 0.013 *5* for the E2/M1 intensity ratio from $^{12}C(p,\gamma)$. In (1975Ma21) $\Gamma_{\gamma0}$=24.5 eV *15* and reduced M1 and E2 transition strengths are deduced after making several assumptions. Using relative intensities measured via $^{11}B(^{3}He,n\gamma)$ and with θ_γ=125° and θ_n=0°, they obtained Γγ0(M1)=24.2 eV *15*, Γγ0(E2)=0.32 eV *12*, Γγ1(E1)≤2.18 eV *30* and Γγ2(M1)=19.6 eV *14*. (1977Ma16): $\Gamma_{\gamma0}/\Gamma_{p0}$=0.121 *11*.
18.44×10^{3} *4*		T=3/2 E(level),T: and T from (1969Ad02).
18.98×10^{3} *2*	40 keV *20*	T=3/2 E(level),Γ,T: and T from (1969Ad02).

† From DWBA analysis in (1971Hs03), except where noted.

$\gamma(^{13}N)$

E_γ	E_i(level)	J^π_i	E_f	J^π_f	Comments
11.5×10^{3}	15068	3/2$^-$	3502	3/2$^-$	(1975Ma21: with $^{12}C(p,\gamma)$ data): Γ_γ(M1)=19.6 eV *14* and B(M1)W=0.613 *44*.
12.71×10^{3}	15068	3/2$^-$	2358	1/2$^+$	(1975Ma21: with $^{12}C(p,\gamma)$ data): Γ_γ(E1) ≤ 2.82 eV *30* and B(E1)W ≤ 03.69E-3 *39*.
15068	15068	3/2$^-$	0	1/2$^-$	(1973Ad02): Combined their Γ_{p0}/Γ=0.236 *12* value with $\Gamma_{p0}\Gamma_{\gamma0}/\Gamma$=5.5 eV *8* from (1968Di04) and obtained $\Gamma^{M1}_{\gamma0}$=23.0 eV *36* and $\Gamma_{\gamma0}$=23.3 eV *36*. (1975Ma21: with $^{12}C(p,\gamma)$ data $\Gamma_{p0}\Gamma_{\gamma0}/\Gamma$=5.79 eV *20* and the Γ_{p0}/Γ value from (1973Ad02)): Γ_γ(M1)=24.2 eV *15*, Γ_γ(E2)=0.32 eV *12* and B(M1)W=0.342 *21* and B(E2)W=0.28 *11*; I(E2/M1)=0.013 *5* See discussion in (1975Ku21).

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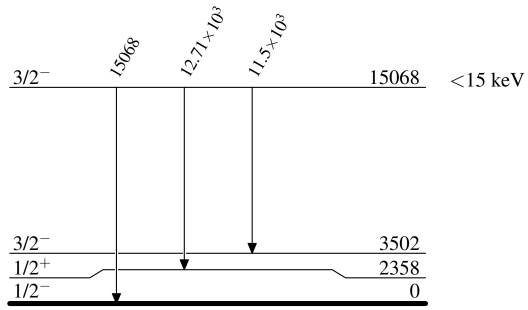
Level Scheme



$^{13}_{7}N_{6}$