Adopted Levels, Gammas 2017Ke05

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	J. H. Kelley, J. E. Purcell and C. G. Sheu	NP A968,71 (2017)	1-Jan-2017

Q(β^-)=13369.4 *13*; S(n)=3369.6 *13*; S(p)=14096.7 *13*; Q(α)=−10001.3 *13* 2017Wa10

Analyses of the ^{12}B density profile have been carried out based on measurements of various reaction cross sections and momentum distributions of breakup products. See discussions in references listed below.

1988Ta10: ^{9}Be, ^{12}C, ^{27}Al(^{12}B,X) E=790 MeV/nucleon, measured interaction σ. Deduced $R^{matter}_{r.m.s.}$=2.39 fm *2*.

1989Sa10: Cu(^{12}B,^{12}B), measured reaction σ for projectile ^{12}B.

1999Bo46: ^{12}C(^{12}B,X) E=920 MeV/nucleon, measured cross section.

2000Ch20: ^{nat}C(^{12}B,X) E≈930 MeV/nucleon, measured charge-changing σ.

2000Sa47: ^{nat}C(^{12}B,X) E≈43-97 MeV/nucleon, measured one-neutron removal σ.

2004Sa14: ^{nat}C(^{12}B,X) E≈43-68 MeV/nucleon, measured one-neutron removal σ, P(^{11}B)$_{parallel}$ distribution.

2010Li18: ^{nat}Si(^{12}B,X), E=54.4 MeV/nucleon, measured reaction products; deduced total reaction σ.

See analysis in (2010Li18) suggesting $R^{matter}_{r.m.s.}$≈2.33 fm and in (2014Es07) suggesting 2.31 fm *7*. See also (1990Li39, 1990Lo10, 1999Kn04, 2000Bh09, 2000Ca33, 2001Oz04, 2002Br01, 2003Ca07, 2004Ca45, 2006Bh01, 2006Sh20, 2011Ku06).

^{12}B Levels

Cross Reference (XREF) Flags

A	^{12}Be β^- decay	K	^{10}B(t,p)	U	^{12}C(n,p)
B	^{2}H(^{14}C,α)	L	^{11}B(n,γ):E=thermal	V	^{12}C(d,2p)
C	^{4}He(^{8}Li,α):res	M	^{11}B(n,γ):res	W	^{12}C(t,^{3}He)
D	^{6}Li(^{7}Li,p)	N	^{11}B(n,n),(n,n′):res	X	^{12}C(^{7}Li,^{7}Be)
E	^{7}Li(^{7}Li,d),^{7}Li(^{7}Li,^{12}B)	O	^{11}B(n,α)	Y	^{12}C(^{12}Be,^{12}B),^{1}H(^{12}Be,^{12}B)
F	^{7}Li(^{9}Be,^{12}B)	P	^{11}B(p,π^+)	Z	^{12}C(^{12}C,^{12}N)
G	^{9}Be(t,n):res	Q	^{11}B(d,pγ),^{2}H(^{11}B,p)	Others:	
H	^{9}Be(α,p)	R	^{11}B(^{7}Li,^{6}Li)	AA	^{12}C(^{13}C,^{13}N)
I	^{9}Be(^{6}Li,^{3}He)	S	^{12}C(γ,π^+)	AB	^{13}C(d,^{3}He)
J	^{9}Be(^{7}Li,α)	T	^{12}C(μ^-,ν)	AC	^{14}C(p,^{3}He)

E(level)[#]	J$^\pi$	T$_{1/2}$	XREF	Comments
0	1$^+$	20.20 ms *2*	AB DE IJKLM PQRSTUVWX Z	XREF: Others: AA, AB, AC %β^-=100; %$\beta^-\alpha$=0.60 *2* T=1; μ=+1.00306 *15*; Q=0.0134 *14* T$_{1/2}$: From (1978Al01). Earlier values are reported in (1968Aj02). The next most significant reported values are: 20.3 ms *1* (1963Fi05), 20.2 ms *2* (1963Pe10), 20.80 ms *15* (1962Ne14), 20.15 ms *20* (1962Po02), 20.31 ms *20* (1961Sc09) and 20.6 ms *2* (1958Kr65).
953.14 *60*	2$^+$	180 fs *28*	B DE IJKL PQRSTUV X Z	XREF: Others: AA, AB, AC %IT=100 E(level): From (1966Wi01); also see E$_x$=935.05 *20* (2016Fi06). T$_{1/2}$: From average of (1968Ol01,1969Ga16,1970Ga09).
1673.65 *60*	2$^-$	<35 fs	DE IJK PQRST V X Z	XREF: Others: AA %IT=100 E(level): From (1966Wi01). T$_{1/2}$: From (1968Ol01).
2620.8 *12*	1$^-$	<35 fs	DE JK PQR T VWX Z	XREF: Others: AA %IT=100 E(level): From (1968Ol01). T$_{1/2}$: From (1969Th01).
2723 *11*	0$^+$		DE JK Q	XREF: Others: AB

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas 2017Ke05 (continued)

^{12}B Levels (continued)

E(level)[#]	J^{π}	$T_{1/2}$	XREF	Comments
				%IT=100 E(level): From (Buechner et al., Phys. Rev. 79 (1950) 262, 1953El12).
3389.1 *16*	3^{-}	3.1 eV *6*	D IJK MN PQR V X Z	XREF: Others: AA %IT=0.8; %n=99.2 E(level),Γ: From (1969Mo10). Γ_n=3.1 eV *6*, Γ_γ=25 meV *8* (1969Mo10).
3760 *6*	2^{+}	40 keV *4*	B D IJK MN PQ V X	XREF: Others: AB %IT=8.0×10^{-4}; %n≈100 Γ_γ=0.30 eV *15* (1962Im01). E(level): From (1960Ja17,1975Aj02,1978Aj02) and references in (1968Aj02). Γ: From (1964Mi04) and references in (1968Aj02).
4000[‡]	0^{-}		V	E(level): From (2007De28,2008WoZZ).
4302 *6*	1^{-}	9 keV *4*	D JK MN PQ V X	%IT=3.3×10^{-3}; %n≈100 Γ_γ=0.30 eV *15* (1962Im01). E(level): From average of (1962Im01,1964Mi04,1975Aj03). Γ: From (1962Im01).
4460[†]	2^{-}	260 keV	N S UVWX Z	XREF: Others: AA %n≤100 E(level): From (1999Bo26,1994Ic03,1995Ic01). Also See (2007De28,2008WoZZ). Γ: From (2007De28,2008WoZZ).
4523[†] *8*	4^{-}	110 keV *20*	D JK MN PQRS X Z	%IT=1.8×10^{-4}; %n≈100 Γ_γ=0.3 eV *1* (1962Im01). E(level): From (1960Ja17,1975Aj03,1978Aj02,1983Ko03, 2007De28,2008WoZZ). Γ: From (1964Mi04,1983Ko03).
4990 *12*	1^{+}	50 keV *15*	B D JK MN P V	XREF: Others: AB %IT=1.8×10^{-3}; %n≈100 E(level): From (1975Aj03,1983Ko03). Γ: From (1964Mi04,1975Aj03,1983Ko03). Γ_γ=0.9 eV *5* (1962Im01).
5610 *8*	3^{+}	115 keV *20*	B D JK N P R V Z	XREF: Others: AC %n≤100 E(level): From (1960Ja17,1975Aj03,1978Aj02,1983Ko03). Γ: From (1964Mi04,1983Ko03).
5726 *8*	3^{-}	58 keV *12*	JK N R X	%n≤100 E(level): From (1960Ja17,1975Aj03,1983Ko03). Γ: From (1960Ja17,1964Mi04,1983Ko03).
6000	1^{-}		N	%n≤100 E(level): From (1983Ko03). Γ: Broad.
6200?[‡]			X	E(level): From (1990Na03,1990Na24).
6600	1^{+}	140 keV	N	%n≤100 E(level),Γ: From (1961Fo07).
7060	1^{-}		N	%n≤100 Γ: Broad. E(level): From (1983Ko03).
7300[‡]			W	Γ: Very broad. E(level): From (1997Da28).
7545 *20*		<14 keV	JK N	%n≤100 E(level),Γ: From (1975Aj03).
7670	2^{-}	45 keV	H N V	%n≤100 E(level),Γ: From (1983Ko03).

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas 2017Ke05 (continued)

^{12}B Levels (continued)

E(level)[#]	Jπ	$T_{1/2}$	XREF	Comments
7.7×10³[†‡] *1*	1⁻	1.90 MeV *10*	S UV X Z	XREF: Others: AA E(level),Γ: From (1989Be50,1993Be19).
7800[‡]		4.0 MeV *5*	U X	XREF: Others: AA E(level): Giant Dipole Resonance. E(level),Γ: From (1992Na13).
7836 *20*	1⁻	60 keV *40*	H J N	%n≤100 E(level),Γ: From (1975Aj03).
7937 *20*	1⁻	<40 keV	H J N	%n≤100 E(level),Γ: From (1975Aj03).
8130 *15*	(3⁻)	260 keV *80*	H J N	%n≤100 E(level),Γ: From (1975Aj03,1992Bo16).
8165[‡] *25*		45 keV *15*	H K	E(level): From (1978Aj02,1992Bo16). Γ: From (1992Bo16).
8240 *30*	3⁻	65 keV	J N	%n≤100 E(level): From (1975Aj03). Γ: From (1983Ko03).
8390[‡] *20*		40 keV *15*	H JK	E(level),Γ: From average of (1975Aj03, 1992Bo16).
8580 *30*	(3⁻)	75 keV	JK N	%n≤100 E(level): From (1975Aj03). Γ: From (1983Ko03).
8707 *20*	(3⁻)		J N	%n≤100 E(level): From (1975Aj03).
9035 *5*	1⁻	95 keV *20*	H JK N	%n≤100 E(level): From (1994Ma05). Γ: From (1978Aj02).
9175 *20*	(2⁻)		J N	%n≤100 E(level): From (1975Aj03).
9300[‡]	0⁻	≈330 keV	V	E(level),Γ: From (2007De28, 2008WoZZ). In (2017Ke05), two Jπ=0⁻ levels were listed from ^{12}C(d,2p). Only the level at E_x=9.3 MeV should have been listed.
9397[‡] *6*		35 keV *10*	H	E(level): From (1992Bo16,1994Ma05). Γ: From (1992Bo16).
9440[‡] *8*		60 keV *20*	H JK	E(level): From (1992Bo16,1994Ma05). Γ: From (1992Bo16).
9582 *3*	3⁻	34 keV *4*	H JK N	%n≤100 E(level): From (1975Aj03, 1978Aj02, 1979Au07, 1992Bo16, 1994Ma05). Γ: From (1975Aj03,1978Aj02,1979Au07,1992Bo16).
9758[‡] *20*			J	E(level): From (1975Aj03).
9830?[‡]			J	E(level): From (1975Aj03).
10000 *40*		100 keV	J N	%n≤100 E(level): From (1975Aj03). Γ: From (1983Ko03).
10115[‡] *11*	1⁻	≈200 keV	H J V	XREF: Others: AA E(level): From (1991Ku10). Γ: From (1991Ku10, 2007De28, 2008WoZZ).
10211 *12*	2⁻	9 keV *3*	H JK Q	%n≈100 Γ_n=8.6 keV *29*; $\Gamma\alpha$<2.1×10^{-3} keV E(level): From (1975Aj03, 1978Aj02, 1992Bo16, 1994Ma05). Γ: From (1994Ma05,1994Ma06).

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas 2017Ke05 (continued)

^{12}B Levels (continued)

E(level)[#]	J^{π}	$T_{1/2}$	XREF	Comments
10420[‡] *10*	<4^{-}	76 keV *20*	H J	E(level): From (1975Aj03, 1991Ku10, 1992Bo16, 1994Ma05). Γ: From (1975Aj03, 1992Bo16, 1994Ma05).
10564 *3*	2^{-}	11 keV *3*	H JK N Q	%n=80; %α=20 Γ_n=8.8 keV *25*; Γα=2.2 keV *8* E(level): From (1975Aj03, 1991Ku10, 1992Bo16, 1994Ma05). Γ: From (1994Ma05).
10580?		200 keV	O	%n<100; %α<100 E(level),Γ: From (1990Pa22,1991Pa26).
10881 *4*	3^{+}	17 keV *4*	F H JK Q	Γ_n=13.6 keV *33*; Γα=3.4 keV *11* E(level): From (1975Aj03, 1978Aj02, 1992Bo16, 1994Ma05). Γ: From (1975Aj03, 1978Aj02, 1992Bo16, 1994Ma05).
11080?			J	%α≤100 E(level): From (2003So22).
11337[‡] *7*	<8	90 keV *25*	H J	E(level): From (1975Aj03, 1991Ku10, 1992Bo16, 1994Ma05). Γ: From (1975Aj03, 1992Bo16, 1994Ma05).
11573 *6*	<8	60 keV *20*	EF H J	%α=100 E(level): From (1975Aj03, 1992Bo16, 1994Ma05). Γ: From (1975Aj03, 1992Bo16, 1994Ma05).
12227 *9*		155 keV *60*	H N	%n≤100 E(level): From (1992Bo16, 1994Ma05). Γ: From (1992Bo16).
12335[‡] *15*		62 keV *25*	H JK	E(level): From (1975Aj03, 1978Aj02, 1992Bo16). Γ: From (1975Aj03, 1992Bo16).
12733 *40*	0^{+}	<40 keV	Y	XREF: Others: AC %α=100 T=2 E(level): From (1976As01, 2008Ch28). Γ: From (2008Ch28).
12760[‡] *15*		110 keV *35*	H J	E(level),Γ: From (1975Aj03, 1992Bo16).
12.8×10^{3}[‡] *5*		3.5 MeV *5*	X	E(level),Γ: From (1992Na13).
13310 *15*		53 keV *12*	H J Y	%α≤100 E(level),Γ: From (1975Aj03, 1992Bo16).
13.4×10^{3} *1*			C EF K Z	%α=100 Γ: Broad. E(level),Γ: From (1978Aj02).
≈14100			C EFG J	%α>94.4; %^{3}H<5.1 E(level): From (2005Cu06). See also E_x≈14.4 (2011To05, 2012Di22). E(level): Thirteen states with 13.6 MeV<E_x<14.7 MeV are reported in ^{9}Be(t,n) (Valter, et al., Ukr. Fiz. Zh. 6 (1961) 457).
14820 *50*	2^{+}	<100 keV	Y	XREF: Others: AC %α=76.0; %^{3}H=23.8; %p=0.2 T=2 E(level),Γ: From (2008Ch28).
≈15700			C EF J	%α>99.6; %^{3}H<0.4 E(level): From (2004So19).
17400			F	%α≤100 E(level): From (2004So19).

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas 2017Ke05 (continued)

^{12}B Levels (continued)

E(level)[#]	$T_{1/2}$	XREF		Comments
17.8×10^{3} *15*	3.5 MeV *15*	J	X	%α≤100 E(level),Γ: From (1992Na13).
18200[‡]				XREF: Others: AA E(level): From (1987Ad07).

† Spin Dipole Resonance.
‡ Decay mode not specified.
# The (1990Aj01) evaluation identified states at E_x=21.8 and 23.9 MeV, however this result was obtained from a misinterpretation of (1987Na16).

$\gamma(^{12}B)$

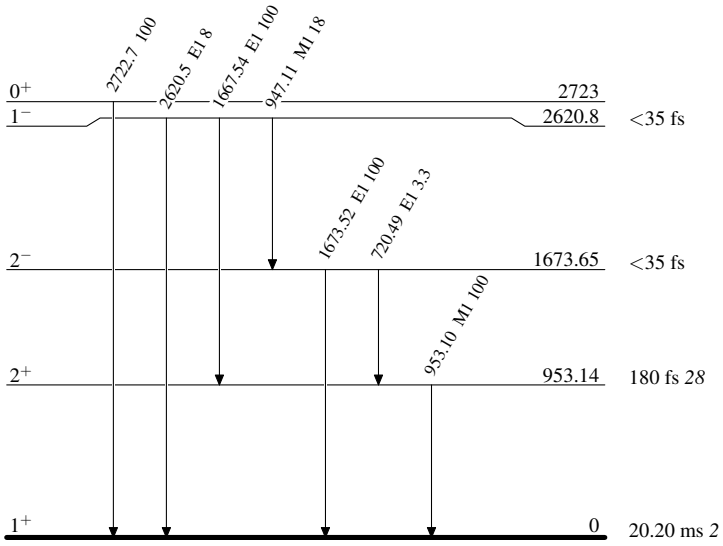
E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π	Mult.	Comments
953.14	2$^+$	953.10	100	0	1$^+$	M1	Γ_γ=2.53×10^{-3} eV *40*; B(M1)(W.u.)=0.14 *2*
1673.65	2$^-$	720.49	3.3 *4*	953.14	2$^+$	E1	Γ_γ>4.2×10^{-4} eV; B(E1)(W.u.)>0.003 I_γ: From (1968Ol01).
		1673.52	100 *4*	0	1$^+$	E1	Γ_γ>1.3×10^{-2} eV; B(E1)(W.u.)>0.008
2620.8	1$^-$	947.11	18 *4*	1673.65	2$^-$	M1	Γ_γ>1.9×10^{-3} eV; B(M1)(W.u.)>0.11
		1667.54	100 *4*	953.14	2$^+$	E1	Γ_γ>1.1×10^{-2} eV; B(E1)(W.u.)>0.0066
		2620.5	8 *1*	0	1$^+$	E1	Γ_γ>8.2×10^{-4} eV; B(E1)(W.u.)>1.3×10^{-4}
2723	0$^+$	2722.7	100	0	1$^+$		

† From level energy difference; recoil correction applied.
‡ Percent photon branching from each level.

Adopted Levels, Gammas 2017Ke05

Level Scheme

Intensities: Relative photon branching from each level



$^{12}_{5}B_{7}$