Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. Shamsuzzoha Basunia	NDS 127, 69(2015)	1-Apr-2015

Q(β^-)=−18601 *SY*; S(n)=19385 *16*; S(p)=5504.3 *4*; Q(α)=−8142.5 *5* 2012Wa38
ΔQ(β^-)=401(syst) 2012Wa38.

^{22}Mg Levels

Cross Reference (XREF) Flags

A	^{22}Al ε decay	F	^{12}C(^{16}O,^{6}He)	K	^{24}Mg(p,t)
B	^{23}Si εp decay	G	^{12}C(^{22}Mg,^{22}Mg′)	L	^{24}Mg(α,^{6}He)
C	^{1}H(^{21}Na,γ)	H	^{12}C(^{23}Al,^{22}Mgγ)	M	^{25}Mg(^{3}He,^{6}He)
D	^{1}H(^{21}Na,P): res	I	^{18}Ne(α,p)		
E	^{12}C(^{12}C,2nγ)	J	^{20}Ne(^{3}He,n),(^{3}He,nγ)		

E(level)†	J$^\pi$	$T_{1/2}$&	XREF	Comments
0.0	0$^+$	3.8755 s *12*	ABC EF HIJK M	%ε+%β^+=100 δ<r^2>(^{26}Mg,^{22}Mg)=+0.214 fm^2 *5* (stat) *51* (syst) (2012Yo01). <r^2>$^{1/2}$=3.0691 fm *7* (stat) *86* (syst) (2012Yo01). J$^\pi$: L=0 in (p,t). $T_{1/2}$: From 2003Ha20. Other value: 3.857 s *9* (1972Ha58,1975Ha21). 2015Ha07 Weighted average of data in 2003Ha20 and 1975Ha21 is 3.8752 s *24* at 2σ (2015Ha07).
1247.02 *3*	2$^+$	2.0 ps *8*	ABC EF H JK M	J$^\pi$: L=2 in (p,t); E2 γ to 0$^+$. $T_{1/2}$: From weighted average of 2.9 ps *10* (1975Gr04) and 1.3 ps *9* (symmetric value of 0.7 ps *+15−3* (1972Ro20)) in (^{3}He,n),(^{3}He,nγ).
3308.22 *6*	4$^+$	200 fs *45*	A C EF H JK M	J$^\pi$: E2 γ to 2$^+$, member of isobaric triplet.
4402.0 *3*	2$^+$	<21 fs	C EF JK M	J$^\pi$: L=(2) and natural parity in (p,t). (M1) to 2$^+$, γ′s to 0$^+$ and 4$^+$.
5035.4 *5*	2$^+$	<0.07 ns	EF JK M	E(level): From (^{12}C,2nγ). J$^\pi$: L=2 in (^{3}He,n) and L=(2) and natural parity in (p,t).
5089.3 *8*	(1$^+$)		E K M	J$^\pi$: Assigned in 2005Se02 (^{12}C,2nγ) based on γ ray feeding and transition characteristics.
5293.11 *16*	(4$^+$)	44 fs *15*	A E H JK	J$^\pi$: (M1+E2) γ to 4$^+$. 2005Se02 (^{12}C,2nγ) assigned 4$^+$ comparing with a 4$^+$ state at 5146.0 keV in ^{22}Ne mirror. Natural parity in (p,t).
5296.0 *4*	(2$^-$)		E J	J$^\pi$: Dipole γ to 2$^+$. 2005Se02 (^{12}C,2nγ) assigned 2$^-$ comparing with a 2$^-$ state at 5146.0 keV in ^{22}Ne mirror.
5318 *4*	(1,2,3)	<17 ns	J	J$^\pi$: γ to 0$^+$.
5452.4 *4*	(3$^+$)	<0.07 ns	A E JK	XREF: J(5464). J$^\pi$: Dipole γ to 2$^+$. 2005Se02 (^{12}C,2nγ) assigned 3$^+$ in analogy with a 3$^+$ state at 5641.2 keV in ^{22}Ne mirror. Natural parity in 2001Ba17 (p,t) probably doubtful − 2005Se02 note the strength is noticeably suppressed.
5711.4 *7*	2$^+$	28 fs *10*	C EF JK M	J$^\pi$: L=2 in and natural parity in (p,t); L=2 in (^{3}He,n). Γ_p/Γ<0.20 (2003Da36).
5838 *5*	2$^+$,3,4$^+$	<17 ns	C J	J$^\pi$: γ′s to 2$^+$ and 4$^+$.
5953.8 *8*	0$^+$		C JK	XREF: J(5980). Γ_p/Γ=0.98 *1* (2003Da36). E(level): From (p,t). J$^\pi$: L=0 in (^{3}He,n) and (p,t).
6043 *3*	(0$^+$)		C F KLM	E(level): From 6036.2 *8* (p,t), 6042 *13* (^{21}Na,γ), 6051 *4* (^{3}He,^{6}He), 6041 *11* (^{16}O,^{6}He), 6059 *9* (α,^{6}He) using The Limitation of Relative Statistical Weight method (1985ZiZY). J$^\pi$: Natural parity in 2001Ba17 (p,t), L=0 in (p,t). However,

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Adopted Levels, Gammas (continued)

^{22}Mg Levels (continued)

E(level)[†]	Jπ	$T_{1/2}$[&]	XREF	Comments
				2003Da36 assign 1^-.
				Γ_p/Γ=0.97 *3* (2003Da36).
6226.1 *10*	(4^+)		A C F K M	E(level): From (p,t).
				Jπ: L=4 in (^{3}He,n); Analogue state of 6345.1 (J^π=4^+) in ^{22}Ne. (2009Ma68).
6242.7? *11*			C F M	XREF: F(6255).
				E(level): From (^{21}Na,γ). Evaluator lists this level as doubtful based on observations in 2009Ma68 (p,t). It is noted that 2001Ba17 (p,t) measured a peak at 6241.1 keV *51* (width 26 keV *6*) and suggested as a doublet. 2005Se02 (^{12}C,2nγ) resolved the doublet by measuring a 6^+ state at 6254 keV. 2009Ma68 measured only one level at 6226.1 keV *10* (width 13 keV). Evaluator's note: Average of 6254.23 and 6226.1 is 6240.1.
6254.23[‡] *21*	6^+		E JKL	XREF: K(6226).
				E(level): From (^{12}C,2nγ).
				Jπ: L=6 in ((p,t) – see comments for level at 6226.1), Q γ to 4^+.
6313 *5*	4^+	<17 ns	A JK	E(level): Weighted average of 6307 *8* (^{22}Al β^+ decay) and 6317 *6* (p,t).
				Jπ: L=4 in (p,t) and (^{3}He,n).
6325.6 *10*	(1^+)[#]	13.6 keV *14*	CD K M	E(level): From (^{21}Na,γ).
				Jπ: Analogue state of 6853.5 (J^π=(1^+)) in ^{22}Ne.
				Γ: Other value – 16 keV *3* ((^{21}Na,γ) – 2004Da17).
6476 *8*			A	
6578 *7*	(1^-)[#]	12.8 keV *15*	D JK	E(level): From (p,t).
				Jπ: From differential cross section fittings (2005Ru01).
				Γ_p=11.9 keV *14* and $\Gamma_{p'}$=0.94 keV *11* ((^{21}Na,p) – 2005Ru01).
6608 *2*	(2^+)[#]	17.9 keV *16*	CD F KLM	E(level): Weighted average of 6611 *11* (^{21}Na,p), 6606 *7* (p,t), 6605.4 *25* (^{21}Na,γ), 6616 *4* (^{3}He,^{6}He), 6606 *11* (^{16}O,^{6}He), 6606 *9* (α,^{6}He).
				Jπ: L=0 and natural parity in (^{21}Na,p), analogue state of 6819.4 (J^π=2^+) in ^{22}Ne.
				Γ: Other values: – 30 keV *7* ((^{21}Na,γ) – 2004Da17). Γ_p=17.6 keV *15* and $\Gamma_{p'}$=0.3 keV *1* ((^{21}Na,γ) – 2005Ru01); Γ_p=23 keV *7* ((^{21}Na,p) – 2009He12).
6724 *8*			A	
6766 *12*	(3^-)[#]	105 keV *33*	D F JKLM	Jπ: L=3 in (^{3}He,n). But $(1^+,2^+)$ in 2008He04 (^{21}Na,p).
				E(level): Weighted average of 6792 *17* (^{21}Na,p), 6770 *20* (^{3}He,n),(^{3}He,nγ), 6768.8 *12* (p,t), 6771 *5* (^{3}He,^{6}He), 6767 *20* (^{16}O,^{6}He), and 6766 *12* (α,^{6}He).
				Also Γ_p=94 keV *32* and $\Gamma_{p'}$=11.1 keV *8* (2005Ru01); Γ_p=64 keV *20* (2009He12).
6865 *8*	(3^+)[#]		A	Jπ: From ^{22}Al β^+ decay, log *ft*=5.6 from $(4)^+$.
6876.0 *12*	(1^-)[#]		D F K M	E(level): From (p,t).
6983 *9*	(3^-)		J	Jπ: L=3 in (^{3}He,n).
7027 *9*	$[3^+]$[@]		K	
7048 *5*	$[4^+]$[@]		A K	E(level): Weighted average of 7052 *8* (^{22}Al β^+ decay) and 7045 *7* (p,t).
7060 *7*			K	
7079 *8*	$[1^-]$[@]		K	
7132 *8*	(5^+)		A	Jπ: From ^{22}Al β^+ decay, log *ft*=4.75 from $(4)^+$.
7218.3 *10*	0^+		JKLM	E(level): From (p,t).
				Jπ: L=0 in (^{3}He,n).

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Adopted Levels, Gammas (continued)

^{22}Mg Levels (continued)

E(level)[†]	Jπ	XREF	Comments
7254 *8*	(1⁻)[#]	A D	XREF: D(7270).
7338 *13*	(2⁺)[#]	D K	E(level): From (p,t).
7384 *8*	(3⁻)[#]	D F K M	E(level): Weighted average of 7402 *13* (^{16}O,^{6}He), 7389 *12* (p,t), and 7373 *9* (^{3}He,^{6}He).
7573 *8*		A	
7599.5 *29*	(2⁺)[#]	D KLM	XREF: D(7585). E(level): From (p,t). Γ_p=23 keV *7* ((^{21}Na,p) – 2009He12).
7674 *18*	(1⁻)[#]	D F	XREF: D(7654).
7741.1 *2*		K M	XREF: M(7757). E(level): From (p,t).
7810 *40*	(2⁻)[#]	D J	XREF: D(7802). Jπ: Unnatural parity (^{21}Na,p).
7928 *3*	[2⁺][@]	D F JKLM	XREF: D(7920). E(level): Weighted average of 7920.6 *15* (p,t), 7931 *5* (^{3}He,^{6}He), 7964 *16* (^{16}O,^{6}He), 7938 *9* (α,^{6}He).
8007.0 *14*	[3⁻][@]	A D KL	E(level): from (p,t). Jπ: Natural parity (^{21}Na,p).
8062 *16*		F	
8180.3 *17*	[2⁺][@]	D F KLM	XREF: F(8203)L(8197)M(8229). E(level): From (p,t).
8290 *40*		A J	XREF: A(8339).
8398 *8*	[2⁺][@]	A D F KLM	XREF: D(8353). E(level): Weighted average of 8416 *8* (^{22}Al β^+ decay), 8394 *21* (^{3}He,^{6}He), 8396 *15* (^{16}O,^{6}He), 8380 *10* (α,^{6}He), 8383 *13* (p,t).
8519.3 *21*	(3⁻)[#]	D F JKLM	XREF: F(8547)J(8550)M(8487). E(level): From (p,t). Γ_p=60 keV *20* ((^{21}Na,p) – 2009He12).
8579 *6*		A D K M	E(level): Weighted average of 8589 *8* (^{22}Al β^+ decay), 8598 *20* (^{3}He,^{6}He), and 8572 *6* (p,t).
8657.5 *17*		D F KL	XREF: D(8677)F(8613)L(8644). E(level): From (p,t).
8727	(2⁺)[#]	D	
8743 *14*	[4⁺][@]	K	
8784.5 *23*	[1⁻][@]	F KLM	XREF: F(8754). E(level): From (p,t).
8827	(1⁻)[#]	D	
8933.1 *29*	[2⁺][@]	D F KL	E(level): Weighted average of 8925 *19* (^{16}O,^{6}He) and 8921 *9* (α,^{6}He).
8991 *7*	(1⁻)[#]	A D L	XREF: D(9050). E(level): Weighted average of 8985 *8* (^{22}Al β^+ decay) and 9029 *20* (α,^{6}He).
9080 *7*		F KL	XREF: L(9029). E(level): Weighted average of 9082 *7* (p,t) and 9066 *18* (^{16}O,^{6}He).
9157 *4*	(4⁺)[#]	D F KL	XREF: F(9172). E(level): From (p,t).
9248? *20*		F	
9318 *12*		F K	E(level): Weighted average of 9329 *26* (^{16}O,^{6}He), 9315 *14* (p,t).
9378? *22*		L	E(level): Weighted average of 9378 *22* (^{16}O,^{6}He), 9315 *14* (p,t).
9452? *21*		F	
9481 *18*	[3⁻][@]	F K	E(level): Weighted average of 9452 *21* (^{16}O,^{6}He) and 9492 *13* (p,t).
9529 *7*		A F KL	XREF: A(9518). E(level): Weighted average of 9518 *8* (^{22}Al β^+ decay), 9533 *24* (^{16}O,^{6}He), 9542 *12* (α,^{6}He), and 9546 *15* (p,t).

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Adopted Levels, Gammas (continued)

^{22}Mg Levels (continued)

E(level)†	Jπ	XREF	Comments
			Jπ: [2+] in 2009Ma68 (p,t) and (1−) in 2009Ch28 (p,t).
9640 *9*		F L	E(level): Weighted average of 9638 *21* (^{16}O,^{6}He) and 9640 *10* (α,^{6}He).
9712 *21*	[0+]@	a F K	E(level): From (^{16}O,^{6}He).
9751.6 *27*	(2+,1+)@	a KL	E(level),Jπ: From (p,t). 2009Ma68 (p,t) propose [2+] from mirror analogy with 10137 keV level in ^{22}Ne.
9859 *5*	[0+]@	F KL	E(level): Weighted average of 9827 *44* (^{16}O,^{6}He), 9853 *11* (α,^{6}He), and 9861 *6* (p,t).
9960 *7*		A F L	XREF: A(9965). E(level): Weighted average of 9965 *8* (^{22}Al β^+ decay), 9924 *28* (^{16}O,^{6}He), and 9953 *13* (α,^{6}He).
10084 *13*	[2+]@	F KL	XREF: L(10128). E(level): Weighted average of 10087 *15* (p,t) and 10078 *24* ((^{16}O,^{6}He).
10168 *9*	[3+]@	F K	E(level): From (p,t).
10271.7 *17*	[2+]@	F KL	XREF: F(10297). E(level): Weighted average of 10297 *25* (^{16}O,^{6}He) and 10260 *10* (α,^{6}He).
10418 *8*	[4+]@	A F KL	XREF: L(10389). E(level): Weighted average of 10413 *10* (^{22}Al β^+ decay), 10429 *26* (^{16}O,^{6}He), and 10430 *19* (p,t). Jπ: From (p,t). 2009Ch28, also in (p,t), propose (1−). Considering the presence of this level in ^{22}Al β^+ decay, evaluator lists [4+].
10572 *22*		F I	E(level): Weighted average of 10580 *50* (α,p) and 10570 *25* (α,^{6}He).
10665 *11*	[3−]@	A F KL	E(level): Weighted average of 10678 *12* (^{22}Al β^+ decay), 10660 *28* (^{16}O,^{6}He), 10627 *20* (α,^{6}He), and 10667 *19* (p,t).
10768 *13*	[2+]@	F i KL	E(level): Weighted average of 10750 *31* (^{16}O,^{6}He), 10776 *20* (α,^{6}He), and 10768 *21* (p,t).
10876 *14*	[4+]@	F i K	E(level): Weighted average of 10881 *15* (p,t) and 10844 *38* (^{16}O,^{6}He).
10901 *17*		F I L	E(level): Weighted average of 10910 *50* (α,p), 10844 *38* (^{16}O,^{6}He), and 10915 *20* (α,^{6}He).
11001 *11*	[0+]@	F I KL	E(level): Weighted average of 10990 *50* (α,p), 10980 *31* (^{16}O,^{6}He), 11015 *20* (α,^{6}He), and 10999 *15* (p,t).
11122 *17*		F I L	E(level): Weighted average of 11130 *50* (α,p), 11135 *40* (^{16}O,^{6}He), and 11118 *20* (α,^{6}He).
11231? *20*		L	
11314 *16*	[4+]@	A KL	E(level): From 11313 *20* (α,^{6}He) and 11317 *27* (p,t).
11410 *8*		A	
11499 *17*	[2+]@	K	
11594 *12*		KL	E(level): Weighted average of 11581 *20* (α,^{6}He) and 11603 *16* (p,t). Jπ: (3−,4+) in 2009Ch28 and [1−] in 2009Ma68 both in (p,t).
11748 *17*	[0+]@	KL	E(level): Weighted average of 11742 *20* (α,^{6}He) and 11760 *30* (p,t).
11914 *13*		KL	E(level): Weighted average of 11881 *20* (α,^{6}He) and 11937 *17* (p,t). Jπ: (1−,2+) in 2009Ch28 and [0+] in 2009Ma68 both in (p,t).
12003? *20*		L	
12185 *17*	[3−]@	KL	E(level): Weighted average of 12169 *20* (α,^{6}He) and 12220 *30* (p,t).
12474 *26*	[2+]@	K	
12665 *17*	[3−]@	K	
13014 *37*		A K	E(level): Weighted average of 13018 *56* (^{22}Al β^+ decay) and 13010 *50* (p,t). Jπ: [0+] in (p,t) not consistent, considering population of this level in ^{22}Al β^+ decay from (4)+.
14012 *3*		A G	E(level): IAS of ^{22}Al g.s., J^π=4+. Other value: 14044 keV *15* (1982Ca16).

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Adopted Levels, Gammas (continued)

^{22}Mg Levels (continued)

† From least squares fit to γ-ray energies for excited levels up to 5838 keV.
‡ From (^{12}C,2nγ).
# From R-matrix analysis in 2014Zh05 (^{21}Na,p).
@ Based on mirror analogy with ^{22}Ne nucleus in 2009Ma68 (p,t).
& From (^{3}He,n),(^{3}He,nγ), except otherwise noted. Γ_{tot} from (^{21}Na,p) − additional data listed in the comments section.

γ(^{22}Mg)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.#	δ	Comments
1247.02	2^+	1246.98† *3*	100	0.0	0^+	E2		B(E2)(W.u.)=26 *11*
3308.22	4^+	2061.09† *5*	100	1247.02	2^+	E2		B(E2)(W.u.)=21 *5*
4402.0	2^+	1090‡ *50*	6‡ *5*	3308.22	4^+			
		3154.7‡ *3*	100‡ *5*	1247.02	2^+	(M1)		B(M1)(W.u.)>0.029
		4400‡ *50*	9‡ *5*	0.0	0^+	[E2]		B(E2)(W.u.)>0.33
5035.4	2^+	3788.0‡ *5*	100‡ *5*	1247.02	2^+	(M1)		B(M1)(W.u.)>5.1×10^{-6}
		5037‡ *6*	14‡ *5*	0.0	0^+	[E2]		B(E2)(W.u.)>8.3×10^{-5}
5089.3	(1^+)	3841.0† *10*	55† *9*	1247.02	2^+			
		5089.9† *12*	100† *10*	0.0	0^+			
5293.11	(4^+)	1984.80† *14*	100	3308.22	4^+	(M1+E2)		
5296.0	(2^-)	893.98† *9*	100	4402.0	2^+	D		E_γ: Placement from (^{12}C,2nγ).
5318	(1,2,3)	4070‡ *5*	100‡ *21*	1247.02	2^+			
		5317‡ *6*	43‡ *21*	0.0	0^+			
5452.4	(3^+)	2143.5† *6*	29† *5*	3308.22	4^+			
		4205.4† *5*	100† *7*	1247.02	2^+	D		
5711.4	2^+	4463.5‡ *10*	100‡ *3*	1247.02	2^+	M1+E2	−0.17 *10*	B(M1)(W.u.)=0.007 *3*; B(E2)(W.u.)=0.08 *5*
		5711‡ *1*	15‡ *3*	0.0	0^+	[E2]		B(E2)(W.u.)=0.12 *5*
5838	2^+,3,4^+	2530‡ *45*	25‡ *19*	3308.22	4^+			
		4590‡ *5*	100‡ *19*	1247.02	2^+			
6242.7?		2934.3&		3308.22	4^+			E_γ: From (^{21}Na,γ). Evaluator lists this γ-ray as doubtful based on the existence of the level at 6242.7 keV *11*. Please see comments for the depopulating level.
6254.23	6^+	2945.8† *2*	100	3308.22	4^+	Q		
6325.6	(1^+)	5077.9@		1247.02	2^+			
		6324.6@		0.0	0^+			
6608	(2^+)	2205.9@		4402.0	2^+			
		5360.3@		1247.02	2^+			

† From (^{12}C,2nγ).
‡ From (^{3}He,n),(^{3}He,nγ).
# From γ-ray angular distribution measurements in (^{12}C,2nγ), (^{3}He,n),(^{3}He,nγ) and RUL.
@ Placement from (^{21}Na,γ), calculated by evaluator from level energy difference, recoil energy subtracted.
& Placement of transition in the level scheme is uncertain.

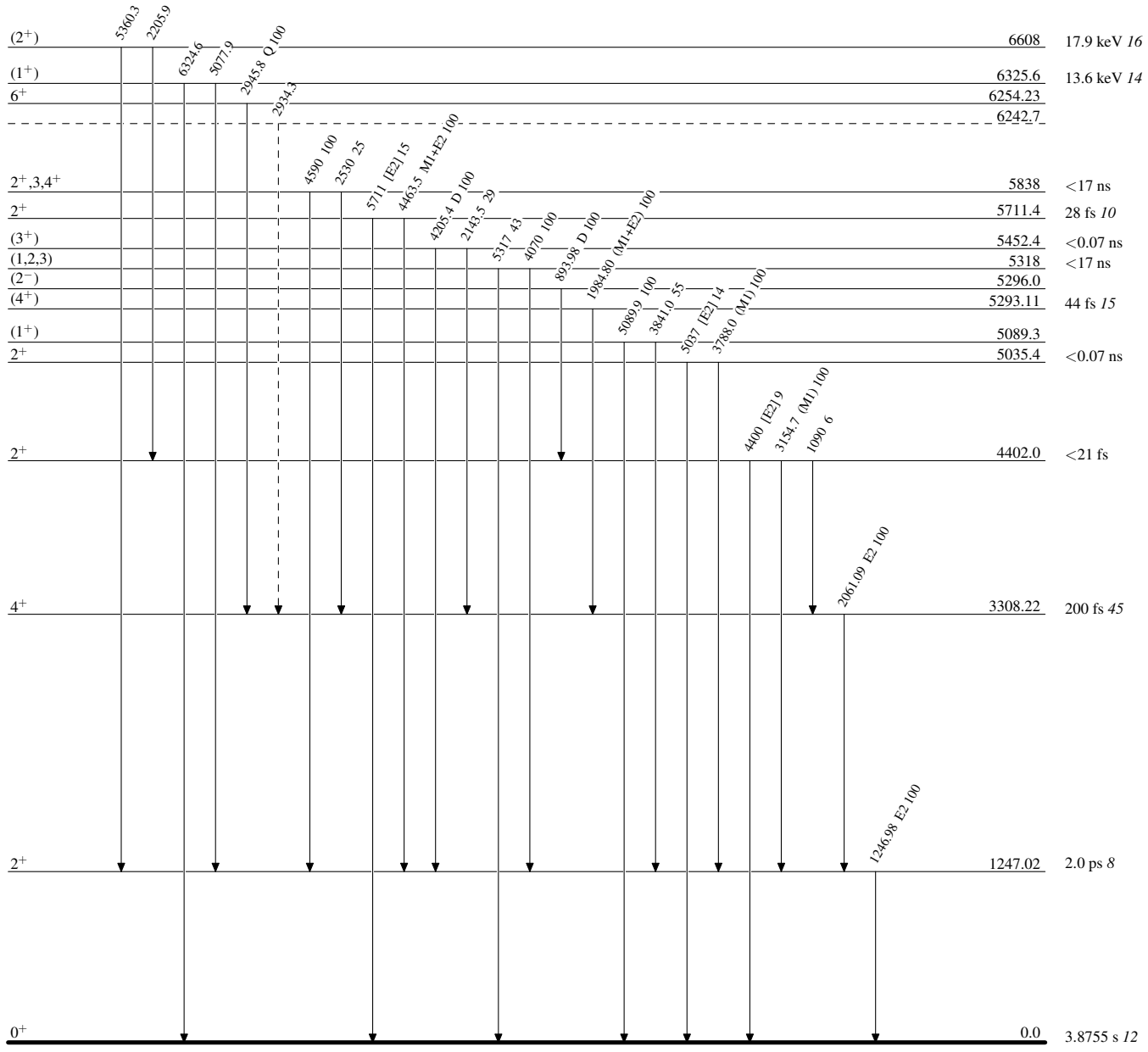
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{22}_{12}Mg_{10}$