Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. Shamsuzzoha Basunia	NDS 199,271 (2025)	1-Sep-2024

Q(β^-)=3855.7 *28*; S(n)=8390 *4*; S(p)=10287 *3*; Q(α)=−8966 *4* 2021Wa16
S(2n)=15040 *6*, S(2p)=24562.9 *29* (2021Wa16).
Other Reactions:

^{238}U(^{82}Se,X), E=505 MeV (2005Lu07); measured γ spectrum of ^{81}As reaction product (no details given).
^{82}Se(μ,νnγ) (2008Zi03, 2006Eg04); measured muon lifetime and capture rate for ^{82}Se; observed 336γ from ^{81}As.
Cumulative or Independent mass yield distribution in the thermal neutron-induced fission of ^{232}U, ^{237}Np, ^{239}Pu, and ^{241}Am are reported in 2022Na14, 2022Na04, 2022Na21, and 2022Na25, respectively, including ^{81}As. Also similar yields are reported in 2021Na07 and 2021Na10.
In-flight fission of ^{238}U, E=950 MeV/nucleon, on Be yields ^{81}As production cross section of 1 mb *1* (2019Pe09).

^{81}As Levels

Cross Reference (XREF) Flags

A	^{81}Ge β^- decay (6.4 s)	D	^{82}Se(d,^{3}He)
B	^{81}Ge β^- decay (7.6 s)	E	^{82}Se(t,α)
C	^{82}Se(μ^-,nγ)	F	^{208}Pb(^{16}O,Xγ)

E(level)†	J$^\pi$	T$_{1/2}$	XREF	Comments
0	3/2$^-$	33.3 s *10*	ABCDEF	%β^-=100 J$^\pi$: L(d,^{3}He)=1; log *ft*=6.6 to 5/2$^-$ at 623.89 in ^{81}Se; 1/2$^-$ discarded based on log *ft*=8.3 *1* (second-forbidden beta transition: 1/2$^-$ to 5/2$^-$). T$_{1/2}$: weighted average of 34 s *2* (1975Kr08), 35.8 s *16* (1974Ch11), 30 s *4* (1962Cr08), 33 s *1* (1960Yt02), 31 s *2* (1960Mo01). Uncertainty is the lowest input value. Other measurement: 43 s *1* (1970OsZZ).
93.09 *5*	(3/2)$^-$		AB D	Additional information 1. J$^\pi$: M1+E2 γ to 3/2$^-$; log *ft*=6.73 from (1/2$^+$) in ^{81}Ge β- decay (6.4 s); γ from (7/2$^-$) at 2197.
290.41 *4*	(3/2)$^-$		AB DE	J$^\pi$: L(d,^{3}He)=1+(3,4); L(α,t)=(1,3); see also comment on J^π(1042). Origin of L=(3,4) component in (d,^{3}He) is not known.
335.97@ *4*	(5/2)$^-$	<0.7 ns	ABCDEF	J$^\pi$: M1,E2 γ to 3/2$^-$; L(t,α)=3; considering connecting γ transitions from (3/2$^+$) at 3136 and 3195 keV levels. T$_{1/2}$: from $\gamma\gamma$(t) (1981Ho24 – ^{81}Ge β- decay (6.4 s)).
737.71 *4*	(5/2)$^-$		AB DEF	J$^\pi$: L(t,α)=3, γ to 3/2$^-$ and (5/2)$^-$. Levels at 727 *9* and 738 *4* in (t,α) and (^{3}He,d), respectively, may differ from state populated in β^- decay, log $f^{1u}t$=8.4 *2* from (1/2$^+$) and negligible β feeding from (9/2$^+$).
757 *9*	7/2$^+$,9/2$^+$		E	J$^\pi$: L(t,α)=4. This level must differ from the 758.4 level known from β^- decay unless the reported L(t,α) (based on σ at only 5 angles) is incorrect.
758.43 *7*	(5/2$^-$,3/2$^+$)		AB	J$^\pi$: γ to 3/2$^-$ g.s.; log *ft*=6.7 from (1/2$^+$) (log^{1u} *ft*>8.5); 2207.5γ from (7/2$^+$) 2965.9. Assumed to differ from the 757 level in β^- decay because the reported L(t,α)=4 is inconsistent with J^π deduced from β^- decay to this 758.4 level.
864.23 *13*	(1/2$^-$,3/2$^-$,5/2$^-$)		AB	J$^\pi$: proposed in 2022De07, based on insignificant β feeding from (9/2$^+$).
1015 *5*	1/2$^-$,3/2$^-$		DE	E(level): weighted average of 1014 *5* from (t,α) and 1015 *5* from (d,^{3}He). J$^\pi$: L(t,α)=1.
1042.02 *7*	(7/2$^-$)		AB E	J$^\pi$: 751.5γ connecting this level with the 290 level for which L(t,α)=1 implies J^π(1042)=(7/2$^-$) and J^π(290)=(3/2)$^-$. Preferred assignment from shell model calculation (2022De07 – ^{81}Ge β^- decay (6.4 s)). log *ft*=6.7 from (9/2$^+$).

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Adopted Levels, Gammas (continued)

^{81}As Levels (continued)

E(level)[†]	Jπ	XREF	Comments
1083.38 *6*	(3/2$^+$,5/2,7/2$^-$)	A	Jπ: γ to 3/2$^-$ g.s.; 1883γ from (7/2$^+$) 2966. Other: (3/2$^-$) in 2022De07.
1128.95[‡][@] *6*	(9/2$^-$)	A EF	Jπ: band member assignment.
1195.03 *9*	7/2[#]	A F	Jπ: 859γ to (5/2)$^-$ 336; 1430γ from (7/2$^+$) 2625.
1496 *6*	1/2$^-$,3/2$^-$	DE	E(level): weighted average of 1497 *8* from (t,α) and 1495 *6* from (d,^{3}He). Jπ: L=1 from (t,α).
1613? *5*	1/2$^+$	DE	E(level): weighted average of 1613 *5* from (t,α) and 1613 *8* from (d,^{3}He). Jπ: L(t,α)=0 based on just 4 data points. This state is not fed in β^- decay from (1/2$^+$) and could only correspond to the 1614 level fed in β^- decay from (9/2$^+$) if L≠0.
1613.54[&] *9*	(9/2$^+$)	A F	Jπ: 876γ to (7/2$^-$) 738 and 1144.7γ from (11/2$^+$) 2758, 9/2$^+$ from shell model (2022De07). Indirectly populated in β^- decay from (9/2$^+$).
1672 *5*	(5/2$^-$,7/2$^-$)	DE	E(level): weighted average of 1674 *5* from (t,α) and 1666 *9* from (d,^{3}He). Jπ: L=(3) from (t,α).
1730.8 *4*	(11/2$^-$)[#]	F	
1869.88 *16*	(5/2$^-$,7/2$^-$,9/2$^-$)	AB	XREF: B(?). Jπ: log *ft*=8.3 from (9/2$^+$), preferred 5/2$^-$ from shell model calculations (2022De07 – ^{81}Ge β- decay (6.4 s) – 5/2$^-$ to 11/2$^-$). 1005.7γ to (1/2$^-$,3/2$^-$,5/2$^-$).
1879 *8*	7/2$^+$,9/2$^+$	E	Jπ: L(t,α)=4.
1914.92 *13*	(7/2,9/2$^-$)	A	Jπ: log *ft*=6.3 from (9/2$^+$); 1156γ to (5/2$^-$,3/2$^+$) 758.4.
2008.28 *21*	(7/2,5/2$^-$,9/2$^-$)	A	Jπ: log *ft*=6.8 from (9/2$^+$); 1672.3γ to (5/2)$^-$.
2077[‡] *13*	(−)	E	Jπ: L(t,α)=(1,3).
2142.08 *9*	(7/2$^+$)	A F	Jπ: log *ft*=6.0 from (9/2$^+$); 1013.0γ to (9/2$^-$) 1128.9, 1058.6γ to (3/2$^+$) 1083.3.
2197.1 *4*	(7/2$^-$)	A	Additional information 2. Jπ: log *ft*=6.2 from (9/2$^+$), γ to (3/2)$^-$.
2250.95[&] *16*	(13/2$^+$)[#]	A F	
2359.3[@] *4*	(13/2$^-$)[#]	F	
≈2518?		E	
2624.51 *6*	(9/2$^+$)[#]	A F	Jπ: log *ft*=4.7 from (9/2$^+$).
2723 *9*	1/2$^-$,3/2$^-$	E	Jπ: L=1 from (t,α).
2758.26[a] *8*	(11/2$^+$)	A F	Jπ: log *ft*=4.9 from (9/2$^+$), preferred (9/2$^+$) in shell model calculations (2022De07). (11/2)$^+$ assumed in (^{16}O,xγ).
2777.4 *3*	(7/2,9/2$^-$)	A	Jπ: log *ft*=6.2 from (9/2$^+$), 2441.4γ to (5/2)$^-$.
2862.46 *17*	(7/2,9/2$^-$)	AB	XREF: B(?). Jπ: log *ft*=5.9 from (9/2$^+$); 2526.5γ to (5/2)$^-$ 336, 2103.9γ to (5/2$^-$,3/2$^+$). Other: (7/2$^+$,9/2$^+$,11/2$^+$) in 2022De07.
2911.94 *12*	(7/2$^+$,9/2$^+$)	AB	XREF: B(?). Jπ: log *ft*=5.6 from (9/2$^+$); γ to (7/2$^-$). Other: (7/2$^+$,9/2$^+$,11/2$^+$) in 2022De07.
2965.91 *9*	(7/2$^+$)	A	Jπ: log *ft*=4.9 from (9/2$^+$); 2629.9γ to (5/2)$^-$ 336.
2974.8[a] *3*	(13/2$^+$)[#]	F	
2999 *3*	1/2$^-$,3/2$^-$	E	Jπ: L=1 from (t,α).
3098 *6*	5/2$^-$,7/2$^-$	E	Jπ: L=3 from (t,α).
3126.4[a] *4*	(15/2$^+$)[#]	F	
3136.28 *13*	(3/2$^+$)	B	Jπ: log *ft*=5.4 from (1/2$^+$); 2800γ to (5/2)$^-$ 336.
3195.42 *18*	(3/2$^+$)	B	Jπ: log *ft*=5.4 from (1/2$^+$); 2859γ to (5/2)$^-$ 336.
3290.2 *3*	(7/2,9/2,11/2)	A	Jπ: log *ft*=6.1 from (9/2$^+$), 665.7γ to (9/2$^+$).
3290.9[a] *5*	(17/2$^+$)[#]	F	
3292.4[@] *5*	(17/2$^-$)[#]	F	
3306[‡] *9*		E	
3368.02 *14*	(7/2$^+$,9/2$^+$,11/2$^+$)	AB	XREF: B(?). Jπ: log *ft*=5.2 from (9/2$^+$), 1453.1γ to (5/2$^-$,7/2,9/2$^-$). Same in 2022De07.
3422.0[&] *11*	(17/2$^+$)[#]	F	

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Adopted Levels, Gammas (continued)

^{81}As Levels (continued)

E(level)[†]	Jπ	XREF	Comments
3480 *7*	$1/2^+$	E	Jπ: L(t,α)=0.
3531.13 *21*	$(1/2^-,3/2)$	B	Jπ: log *ft*=6.2 from $(1/2^+)$; 3195γ to $(5/2)^-$ 336.
3562.72 *15*	$(1/2^+,3/2^+)$	B	Jπ: log *ft*=5.4 from $(1/2^+)$.
3596[‡] *12*	$1/2^+$	E	Jπ: L(t,α)=0.
3669.5[@] *6*	$(21/2^-)$[#]	F	
3742 *9*		E	
3818 *12*	$1/2^-,3/2^-$	E	Jπ: L(t,α)=1.
3914 *8*	$(1/2^+,5/2^-,7/2^-)$	E	Jπ: L(t,α)=(0,3).
3995 *7*	$(1/2^+,5/2^-,7/2^-)$	E	Jπ: L(t,α)=(0,3).

[†] From a least-squares fit to Eγ for levels deexcited by γ rays; from (t,α) for levels excited only in that reaction and weighted average from (t,α) and (d,^{3}He) for levels excited in those two reactions only.
[‡] Doublet in (t,α).
[#] Based on γ transition multipolarity determined from γγ(θ) measurements (^{16}O,xγ).
[@] Band(A): Based on $(5/2)^-$.
[&] Band(B): Based on $(9/2^+)$.
[a] Band(C): Based on $(11/2^+)$.

Adopted Levels, Gammas (continued)

γ(^{81}As)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[†]	δ	α[@]	Comments
93.09	(3/2)$^-$	93.10 *10*	100	0	3/2$^-$	M1+E2	0.24 *6*	0.160 *26*	α(K)=0.140 *22*; α(L)=0.0166 *31*; α(M)=0.0025 *5* α(N)=0.000182 *31* δ: from α(K)exp in ^{81}Ge β$^-$ decay.
290.41	(3/2)$^-$	197.30 *5*	100[‡] *6*	93.09	(3/2)$^-$	(M1)		0.01490 *21*	α(K)=0.01326 *19*; α(L)=0.001411 *20*; α(M)=0.0002153 *30* α(N)=1.633×10^{-5} *23* α(K)exp=0.010 *5* allows E1 or M1; adopted Δπ=no based on level scheme.
		290.35 *5*	52[‡] *4*	0	3/2$^-$				
335.97	(5/2)$^-$	242.84 *9*	4.4 *5*	93.09	(3/2)$^-$				
		335.98 *5*	100 *4*	0	3/2$^-$	M1,E2		0.0067 *27*	α(K)=0.0059 *24*; α(L)=6.4×10^{-4} *27*; α(M)=1.0×10^{-4} *4* α(N)=7.2×10^{-6} *29*
737.71	(5/2)$^-$	401.75 *5*	40 *4*	335.97	(5/2)$^-$				I_γ: weighted average of 48 *14* from ^{81}Ge β$^-$ decay (6.4 s), 41 *4* from ^{81}Ge β$^-$ decay (7.6 s), and 34 *9* from (^{16}O,Xγ).
		737.74 *5*	100 *5*	0	3/2$^-$				
758.43	(5/2$^-$,3/2$^+$)	467.98 *6*	46 *14*	290.41	(3/2)$^-$				
		665.9 *3*	41[‡]	93.09	(3/2)$^-$				
		758.4 *2*	100 *8*	0	3/2$^-$				
864.23	(1/2$^-$,3/2$^-$,5/2$^-$)	771.26 *15*	100	93.09	(3/2)$^-$				
1042.02	(7/2$^-$)	706.07 *10*	72 *20*	335.97	(5/2)$^-$				
		751.51 *10*	100 *7*	290.41	(3/2)$^-$				
1083.38	(3/2$^+$,5/2,7/2$^-$)	747.41 *10*	100 *13*	335.97	(5/2)$^-$				
		792.94 *6*	51 *17*	290.41	(3/2)$^-$				
		990.5 *2*	13.6 *25*	93.09	(3/2)$^-$				
		1083.3 *2*	29 *13*	0	3/2$^-$				
1128.95	(9/2$^-$)	391.34 *11*	9.2 *9*	737.71	(5/2)$^-$				I_γ: weighted average of 9.3 *9* from ^{81}Ge β$^-$ decay (6.4 s) and 8 *4* from (^{16}O,Xγ).
		792.94 *6*	100[#] *16*	335.97	(5/2)$^-$				
1195.03	7/2	859.13 *10*	100	335.97	(5/2)$^-$				
1613.54	(9/2$^+$)	875.84 *10*	100	737.71	(5/2)$^-$				
1730.8	(11/2$^-$)	602.0[#] *4*	100	1128.95	(9/2$^-$)				
1869.88	(5/2$^-$,7/2$^-$,9/2$^-$)	1005.7 *2*	100	864.23	(1/2$^-$,3/2$^-$,5/2$^-$)				
1914.92	(7/2,9/2$^-$)	1156.41 *15*	100	758.43	(5/2$^-$,3/2$^+$)				
2008.28	(7/2,5/2$^-$,9/2$^-$)	1672.3 *2*	100	335.97	(5/2)$^-$				
2142.08	(7/2$^+$)	1013.0 *2*	100 *16*	1128.95	(9/2$^-$)				E_γ: Other: 1013.4 *6* (^{16}O,xγ).
		1058.6 *2*	40 *4*	1083.38	(3/2$^+$,5/2,7/2$^-$)				
		1100.2 *2*	24.7 *27*	1042.02	(7/2$^-$)				

Adopted Levels, Gammas (continued)

γ(^{81}As) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Comments
2197.1	(7/2$^-$)	2104.0 *4*	100	93.09	(3/2)$^-$	
2250.95	(13/2$^+$)	637.4 *2*	100	1613.54	(9/2$^+$)	E_γ: weighted average of 637.2 *2* (^{81}Ge β- decay (6.4 s)) and 637.6 *2* (^{16}O,xγ).
2359.3	(13/2$^-$)	628.6[#] *4*	17[#] *7*	1730.8	(11/2$^-$)	
		1230.2[#] *4*	100[#] *27*	1128.95	(9/2$^-$)	
2624.51	(9/2$^+$)	482.4 *1*	46 *4*	2142.08	(7/2$^+$)	E_γ: Other: 482.4 *4* (^{16}O,xγ).
		709.3 *3*	23 *5*	1914.92	(7/2,9/2$^-$)	
		1429.53 *10*	40 *8*	1195.03	7/2	
		1495.53 *5*	100 *18*	1128.95	(9/2$^-$)	
		1582.27 *15*	32 *7*	1042.02	(7/2$^-$)	
		1886.8 *2*	7.1 *11*	737.71	(5/2)$^-$	
2758.26	(11/2$^+$)	133.70 *6*	98 *23*	2624.51	(9/2$^+$)	
		507.3 *2*	16 *8*	2250.95	(13/2$^+$)	
		616.3 *2*	27 *5*	2142.08	(7/2$^+$)	
		1144.75 *15*	100 *40*	1613.54	(9/2$^+$)	
		1629.45 *13*	69 *13*	1128.95	(9/2$^-$)	I_γ: weighted average of 75 *9* from ^{81}Ge β^- decay (6.4 s) and 40 *20* from (^{16}O,Xγ).
2777.4	(7/2,9/2$^-$)	2441.4 *3*	100	335.97	(5/2)$^-$	
2862.46	(7/2,9/2$^-$)	2103.9 *3*	69[‡] *10*	758.43	(5/2$^-$,3/2$^+$)	
		2526.5 *2*	100[‡] *10*	335.97	(5/2)$^-$	
2911.94	(7/2$^+$,9/2$^+$)	1869.8 *2*	81 *15*	1042.02	(7/2$^-$)	
		2174.32 *15*	100 *19*	737.71	(5/2)$^-$	
2965.91	(7/2$^+$)	1882.51 *8*	100 *22*	1083.38	(3/2$^+$,5/2,7/2$^-$)	
		2207.5 *3*	20.6 *28*	758.43	(5/2$^-$,3/2$^+$)	
		2629.9 *2*	36 *6*	335.97	(5/2)$^-$	
2974.8	(13/2$^+$)	216.5[#] *3*	100[#] *22*	2758.26	(11/2$^+$)	
		723.8[#] *4*	56[#] *22*	2250.95	(13/2$^+$)	
3126.4	(15/2$^+$)	151.6[#] *3*	100	2974.8	(13/2$^+$)	
3136.28	(3/2$^+$)	2377.4[‡] *4*	60[‡] *18*	758.43	(5/2$^-$,3/2$^+$)	
		2800.2[‡] *2*	100[‡] *11*	335.97	(5/2)$^-$	
		2845.8[‡] *2*	49[‡] *7*	290.41	(3/2)$^-$	
		3136.6[‡] *3*	30[‡] *5*	0	3/2$^-$	
3195.42	(3/2$^+$)	2331.3[‡] *2*	85[‡] *9*	864.23	(1/2$^-$,3/2$^-$,5/2$^-$)	
		2436.6[‡]	≈18.9[‡]	758.43	(5/2$^-$,3/2$^+$)	
		2859.1[‡]	≈18.9[‡]	335.97	(5/2)$^-$	
		2904.7[‡] *3*	34[‡] *6*	290.41	(3/2)$^-$	
		3195.1[&‡]	100[&‡]	0	3/2$^-$	
3290.2	(7/2,9/2,11/2)	665.7 *3*	100	2624.51	(9/2$^+$)	
3290.9	(17/2$^+$)	164.5[#] *3*	100	3126.4	(15/2$^+$)	

$^{81}_{33}As_{48}$-5

Adopted Levels, Gammas (continued)

γ(^{81}As) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π
3292.4	(17/2$^-$)	933.1[#] *3*	100	2359.3	(13/2$^-$)
3368.02	(7/2$^+$,9/2$^+$,11/2$^+$)	456.2 *2*	97 *17*	2911.94	(7/2$^+$,9/2$^+$)
		1225.8 *2*	100 *21*	2142.08	(7/2$^+$)
		1453.1 *2*	69 *14*	1914.92	(7/2,9/2$^-$)
3422.0	(17/2$^+$)	1171[#] *1*	100	2250.95	(13/2$^+$)
3531.13	(1/2$^-$,3/2)	3195.1[&‡] *2*	100[&]	335.97	(5/2)$^-$
3562.72	(1/2$^+$,3/2$^+$)	3469.5[‡] *2*	54 *6*	93.09	(3/2)$^-$
		3562.7[‡] *2*	100 *7*	0	3/2$^-$
3669.5	(21/2$^-$)	377.1[#] *4*	100	3292.4	(17/2$^-$)

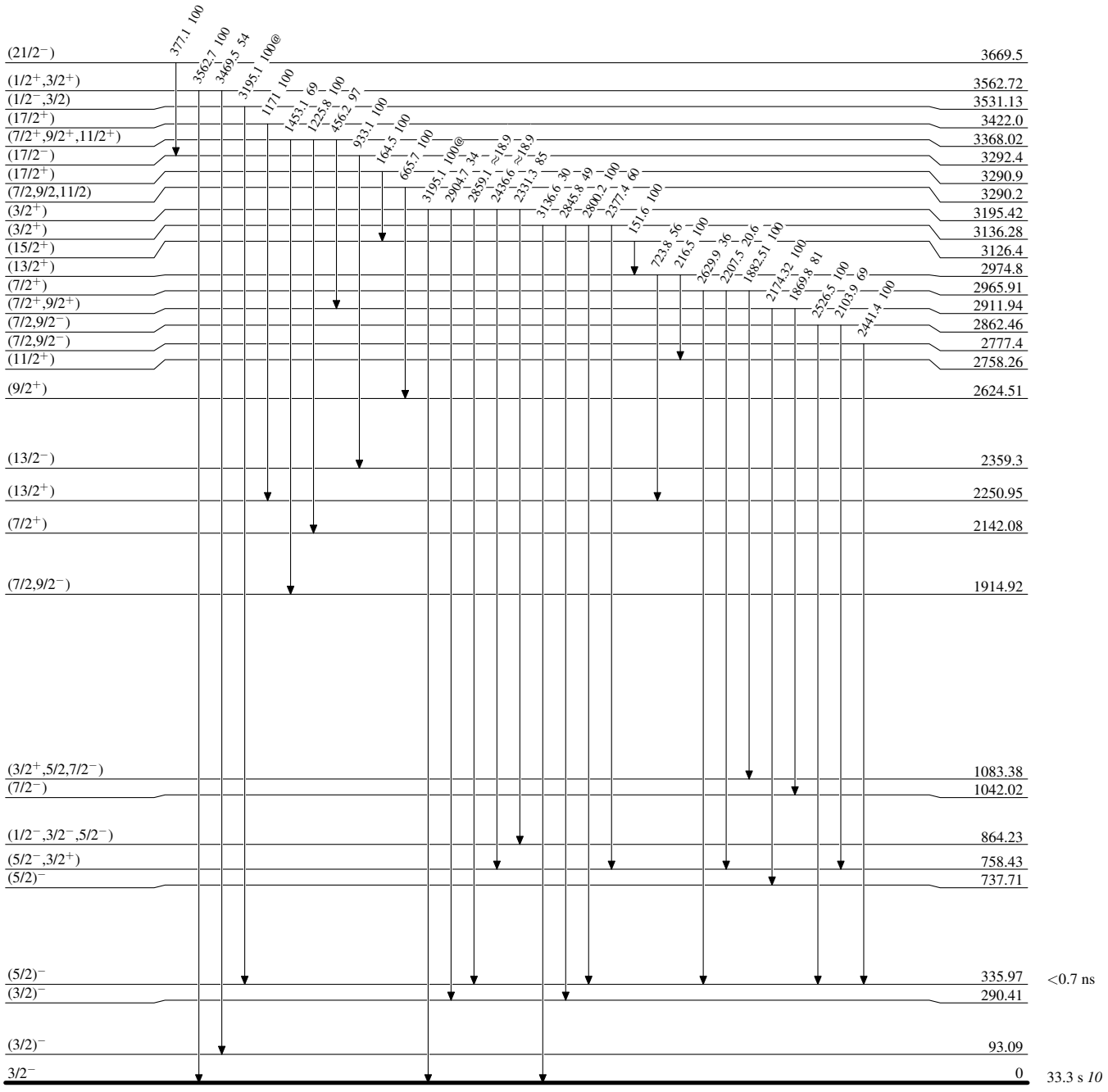
[†] From ^{81}Ge β^- decay (6.4 s), except where otherwise noted.
[‡] From ^{81}Ge β^- decay (7.6 s).
[#] From (^{16}O,xγ).
[@] Additional information 3.
[&] Multiply placed with intensity suitably divided.

$^{81}_{33}As_{48}$-6

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level
@ Multiply placed: intensity suitably divided

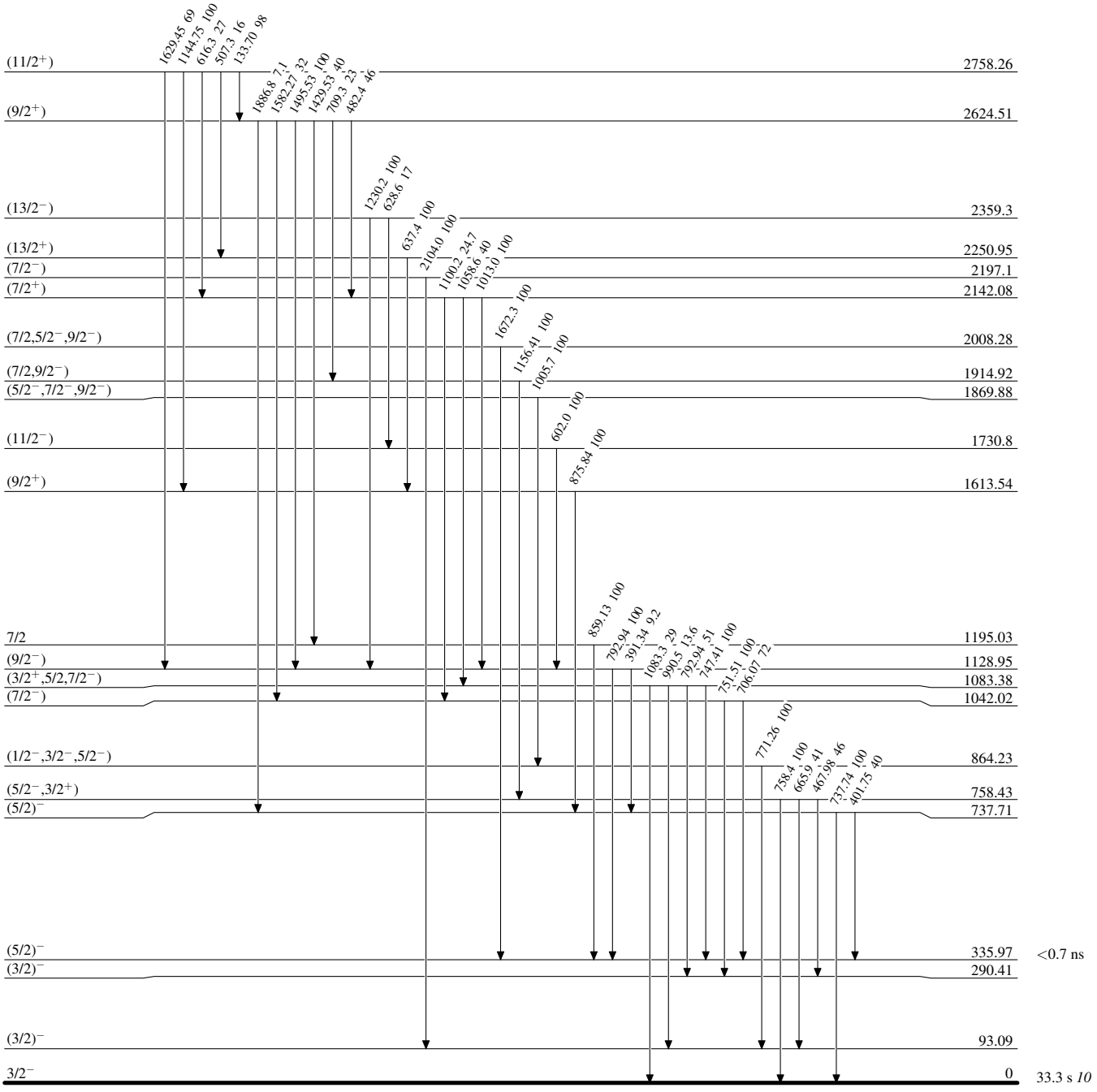


$^{81}_{33}As_{48}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
@ Multiply placed: intensity suitably divided

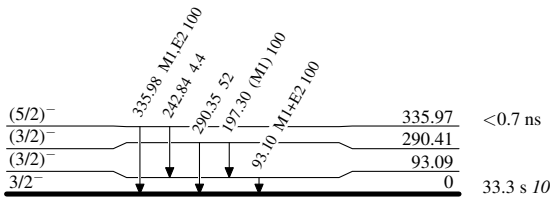


$^{81}_{33}As_{48}$

Adopted Levels, Gammas

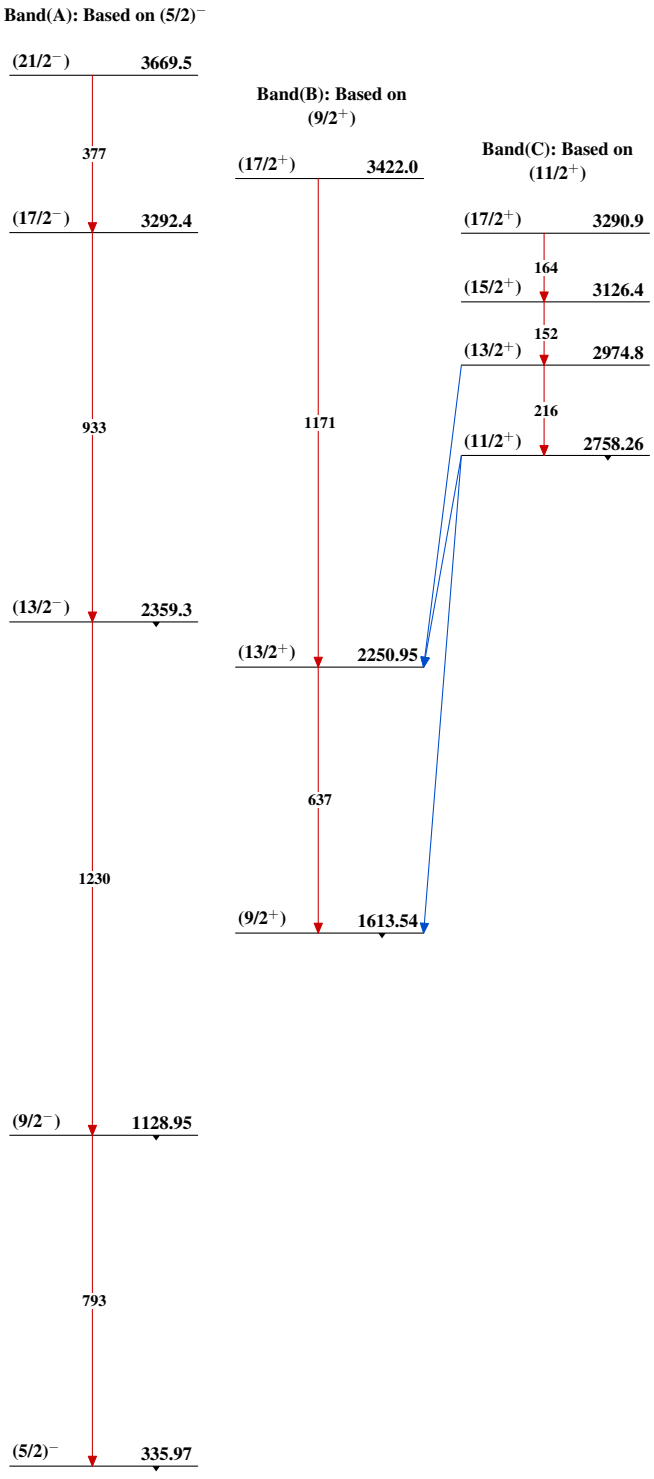
Level Scheme (continued)

Intensities: Relative photon branching from each level
@ Multiply placed: intensity suitably divided



$^{81}_{33}As_{48}$

Adopted Levels, Gammas



$^{81}_{33}As_{48}$