

Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 187,1 (2023)	12-Oct-2022

Q(β⁻)=583.5 12; S(n)=5428.15 10; S(p)=8408.0 13; Q(α)=-134.6 13 [2021Wa16](#)
 S(2n)=14616.0 24, S(2p)=15095.1 13 ([2021Wa16](#)).
[Additional information 1.](#)

¹⁴¹Ce Levels

Cross Reference (XREF) Flags

A	¹⁴¹ La β ⁻ decay	E	¹⁴⁰ Ce(pol p,p),(pol p,p') IAS	I	¹⁴² Ce(d,t)
B	¹³⁸ Ba(α,nγ)	F	¹⁴⁰ Ce(d,p),(d,pγ)	J	¹⁴² Ce(³ He,α)
C	¹³⁹ La(⁷ Li,αnγ)	G	¹⁴⁰ Ce(α, ³ He)		
D	¹⁴⁰ Ce(n,γ) E=thermal	H	¹⁴² Ce(p,d)		

E(level) [†]	J ^π	T _{1/2}	XREF	Comments
0.0	7/2 ⁻	32.504 d 13	ABCDEF HIJ	%β ⁻ =100 μ=1.09 4 (2014StZZ,1983Va36) J ^π : paramagnetic resonance (1976Fu06), L=3 in (d,p). μ: from γ(θ,H,t); others: 1.31 20, 0.97 3, 0.9 1 (1978LeZA). T _{1/2} : weighted average of the following data is 32.504 d 10 (adopted is the minimum unc from measured data): 32.50 d 20 (1950Fr58), 32.60 d 20 (1971Ba28), 32.45 d 13 (1972Em01), 32.501 d 13 (1976Va30), 32.50 d 3 (1980RuZY), 32.51 d 10 (1983Wa26), 32.510 d 24 (1992Un01), 32.2 d 2 (1999Po32), 32.56 d 5 (2012To09). Other results (not included in the weighted average): 32.51 d 6 (1971De11 , superseded by 1983Wa26), 32.51 d 6 (1973MeYE , superseded by 1980RuZY), 32.38 d 2 (1967Ob01 , underestimated unc), 32.550 d 7 (1965An07 , superseded by 1980RuZY), 32.51 d 2 (1957Ke26 , underestimated unc). Additional information 2.
662.06 6	3/2 ⁻		A DEF HI	XREF: H(680). J ^π : L=1 in (d,p), CP(4767γ) in (n,γ).
1137.04 19	1/2 ⁻		A DEF HI	XREF: H(1150). J ^π : L=1 in (d,p), IAS of 1/2 ⁻ resonance (E(p)=10880) in (p,p).
1354.50 9	9/2 ⁻		A EFG	XREF: E(1384). J ^π : L=5 in (d,p); IAS of 9/2 ⁻ resonance (E(p)=11130) in (p,p).
1368.71 18	13/2 ⁺	5.3 ns 3	ABC FG IJ	XREF: I(1361). J ^π : L=6 in (d,p), T _{1/2} consistent with E3 γ to 7/2 ⁻ , not with M2. T _{1/2} : from (α,nγ) (1978KoZR). Other: 4 ns 2 (⁷ Li,αnγ) (1975KI01).
1378.0 [‡] 20	(9/2 ⁻ ,11/2 ⁻)		F HI	J ^π : L=(5) in (d,p), (d,t).
1497.00 9	5/2 ⁻		A DEF I	J ^π : L=3 in (d,p); IAS of 5/2 ⁻ resonance (E(p)=11270) in (p,p).
1626.5 4	(3/2 ⁺)		A HIJ	XREF: H(1600). J ^π : L=2 in (d,t),(³ He,α); γ to 3/2 ⁻ , no γ to 7/2 ⁻ .
1693.31 10	11/2 ⁻		A FG	J ^π : L=5 in (d,p), γ to 13/2 ⁺ .
1739.01 10	7/2 ⁻		A EF I	J ^π : L=3 in (d,p),(d,t); IAS of 7/2 ⁻ resonance (E(p)=11530) in (p,p).
1785 [#] 3	1/2 ⁺		HIJ	J ^π : L=0 in (d,t).
1808.7 3	3/2 ⁻		DEF	J ^π : L=1 in (d,p), γ to 7/2 ⁻ , IAS of 3/2 ⁻ resonance (E(p)=11590) in (p,p).
1812.7 [‡] 9	5/2 ⁻		EF	J ^π : L=3 in (d,p), IAS of 5/2 ⁻ resonance (E(p)=11610) in (p,p).
1915 [#] 3	11/2 ⁻ ,9/2 ⁻		IJ	J ^π : L=5 in (d,t),(³ He,α).
1942 3	1/2 ⁺		I	J ^π : L=0 in (d,t).
1943.9 3			A	

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Adopted Levels, Gammas (continued)

¹⁴¹Ce Levels (continued)

E(level) [†]	J ^π	T _{1/2}	XREF	Comments
1961.5 11	15/2 ⁽⁺⁾		BC H	XREF: H(1910). J ^π : γ to 13/2 ⁺ is ΔJ=1 D; excit. function; syst for N=83 nuclei.
1994.3 4	(1/2 ⁻)		D F	J ^π : L=1 in (d,p), no γ to 7/2 ⁻ .
2030.22 20			A	
2044 10	11/2 ⁻ , 9/2 ⁻		J	J ^π : L=5 in (³ He,α).
2049.3 3			A	
2114.5 [‡] 15	(5/2 ⁻)		EF	XREF: E(2130). J ^π : L=3 in (d,p); IAS of (5/2 ⁻) resonance (E(p)=11840) in (p,p).
2165 [#] 5	11/2 ⁻ , 9/2 ⁻		IJ	J ^π : L=5 in (d,t).
2165.0 15	3/2 ⁻		F	J ^π : L=1 in (d,p), γ to 7/2 ⁻ .
2171.1 3	9/2 ⁻		A HIJ	XREF: H(2180)I(2165)J(2163). J ^π : L=5 in (d,t), (³ He,α), β decay via (7/2 ⁺) parent.
2174.02 16	5/2 ⁻		A F	J ^π : IAS of 5/2 ⁻ resonance (E(p)=11900) in (p,p).
2189 2	(5/2 ⁻ , 7/2 ⁻)		F	J ^π : L=(3) in (d,p).
2189.6 3	3/2 ⁻		DEF	J ^π : L=(1) in (d,p), γ from 1/2 ⁺ in (n,γ), IAS of 3/2 ⁻ resonance (E(p)=11980) in (p,p).
2207.40 14	(7/2 ⁺)		A F I	J ^π : γ's to (3/2 ⁺) and 9/2 ⁻ ; L=(4) in (d,t).
2207.5 15	17/2 ⁽⁺⁾		B	J ^π : γ to 15/2 ⁽⁺⁾ is ΔJ=1 D; syst for N=83 nuclei.
2243 10	(7/2 ⁺ , 9/2 ⁺)		J	J ^π : L=(4) in (³ He,α).
2263 [‡] 2	(7/2 ⁺ , 9/2 ⁺)		EF	J ^π : L=(4) in (d,p).
2266.94 15	(5/2 ⁺)		A F	XREF: F(2263). J ^π : L=(2) in (d,p), γ's to 7/2 ⁻ and 3/2 ⁻ , β decay via 7/2 ⁺ parent.
2272.5 18	(19/2)	2.2 ns 4	B	T _{1/2} : from (α,nγ) (1978KoZR). J ^π : syst for N=83 nuclei, shell model.
2292 2	(+)		F	J ^π : L=(2+4) in (d,p).
2328.9 11	7/2 ⁻		A EF J	J ^π : L=3 in (d,p), no γ to 3/2 ⁻ , 1/2 ⁻ , IAS of 7/2 ⁻ resonance (E(p)=12110) in (p,p).
2336.1 5	3/2 ⁻		DEF	J ^π : L=1 in (d,p), strong γ to 5/2 ⁻ ; IAS of 3/2 ⁻ resonance (E(p)=12140) in (p,p).
2403 5	3/2 ⁺ , 5/2 ⁺		I	J ^π : L=2 in (d,t).
2405.9 9	(5/2 ⁻)		EF	J ^π : L=3 in (d,p) (1971Br05); γ's to 7/2 ⁻ and 1/2 ⁻ ; contradicts L=2 in (d,t) (1979Li12); IAS of (5/2 ⁻) resonance (E(p)=12190) in (p,p).
2410.8 5	1/2 ⁻		DEF	J ^π : L=1 in (d,p), IAS of 1/2 ⁻ resonance (E(p)=12180) in (p,p).
2426.0 5	3/2 ⁻		DEF	J ^π : L=1 in (d,p), IAS of 3/2 ⁻ resonance (E(p)=12210) in (p,p).
2450	(1/2 ⁻)		E	J ^π : IAS to (1/2 ⁻) resonance (E(p)=12230) in (p,p).
≈2450 [‡]	(5/2 ⁻ , 7/2 ⁻)		EF	XREF: E(2410). J ^π : from L=(3) in (d,p),(d,py).
2458 [#] 5	3/2 ⁺ , 5/2 ⁺		HIJ	XREF: H(2440). J ^π : L=2 in (d,t), (³ He,α).
≈2507	(3/2 ⁺ , 5/2 ⁺)		F	J ^π : from L=(2) in (d,p),(d,py).
2523.0 5	1/2 ⁻ , 3/2 ⁻		D F	J ^π : L=1 in (d,p).
2531 10	(9/2 ⁻ , 11/2 ⁻)		J	J ^π : L=(5) in (³ He,α).
2543 5			I	
2555 2			F	
2583 10			J	
2611 2	(1/2 ⁻ , 3/2 ⁻)		F	J ^π : L=(1) in (d,p).
2634 2	5/2 ⁻ , 7/2 ⁻		F	J ^π : L=3 in (d,p).
2649 5	3/2 ⁺ , 5/2 ⁺		I	J ^π : L=2 in (d,t).
2671 10			J	
2800?			H	J ^π : L(p,d)=(5).
2841 5	1/2 ⁺		I	J ^π : L=0 in (d,t).
2886 [#] 5	3/2 ⁺ , 5/2 ⁺		IJ	J ^π : L=2 in (d,t), (³ He,α),(d,p).

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Adopted Levels, Gammas (continued)

¹⁴¹Ce Levels (continued)

E(level) [†]	J ^π	XREF	Comments
≈2899	(3/2 ⁺ ,5/2 ⁺)	F	J ^π : L=(2).
2899 [‡] 2	13/2 ⁺ ,11/2 ⁺	FG	J ^π : L=6 in (α, ³ He) in (d,p),(d,pγ).
2987 [#] 7	1/2 ⁺	IJ	J ^π : L=0 in (d,t),(³ He,α).
3012 [‡] 3		F H	XREF: H(3020).
3055 [#] 7	3/2 ⁺ ,5/2 ⁺	HIJ	XREF: H(3060).
			J ^π : L=2 in (d,t),(³ He,α).
3070 3	5/2 ⁻ ,7/2 ⁻	F	J ^π : L=3 in (d,p).
3070 3	1/2 ⁻ ,3/2 ⁻	F	J ^π : L=1 in (d,p).
3071 [#] 7	3/2 ⁺ ,5/2 ⁺	F I	J ^π : L=2 in (d,t).
3109 3		F	
3114 [#] 7	11/2 ⁻ ,9/2 ⁻	IJ	J ^π : L=5 in (d,t), (³ He,α).
3159 3	(1/2 ⁻ ,3/2 ⁻)	F	J ^π : L=(1) in (d,p).
3175 3		F	
3203 3		F	
3210 7	3/2 ⁺ ,5/2 ⁺	I	J ^π : L=2 in (d,t).
3235 3		F	
3265 3		F	
3297 3	(1/2 ⁻ ,3/2 ⁻)	F	J ^π : L=(1) in (d,p),(d,pγ).
3319 3		F	
3333 [@] 10	5/2 ⁻ ,7/2 ⁻	H J	J ^π : L=3 in (³ He,α).
3351 3	1/2 ⁺	F	J ^π : L=0 in (d,p).
3351 3	(3/2 ⁺ ,5/2 ⁺)	F	J ^π : L=(2) in (d,p).
3408 3	(3/2 ⁺ ,5/2 ⁺)	F	J ^π : L=(2) in (d,p).
3409 10	(11/2 ⁻ ,9/2 ⁻)	J	J ^π : L=(5) in (³ He,d).
3413 9	1/2 ⁺	I	J ^π : L=0 in (d,t).
3449 3		F	
3486 3	(5/2 ⁻ ,7/2 ⁻)	F	J ^π : from L=(3) in (d,p),(d,pγ).
3523 3	(7/2 ⁺ ,9/2 ⁺)	F	J ^π : from L=(4) in (d,p),(d,pγ).
3578 3	(7/2 ⁺ ,9/2 ⁺)	F	J ^π : from L=(4) in (d,p),(d,pγ).
3609 [#] 9	(9/2 ⁺ ,7/2 ⁺)	IJ	J ^π : L=(4) in (³ He,α)
3673 [‡] 3	(3/2 ⁺ ,5/2 ⁺)	F I	J ^π : L=(2) in (d,t),(d,p).
3684 3	(7/2 ⁺ ,9/2 ⁺)	F I	J ^π : from L=(4) in (d,p),(d,pγ).
3704 9		I	

[†] For levels populated and decayed by γ rays, from least-squares fit to E_γ's.

[‡] From ¹⁴⁰Ce(d,p),(d,pγ).

[#] From ¹⁴²Ce(d,t).

[@] From ¹⁴²Ce(³He,α).

γ(¹⁴¹Ce)

E _i (level)	J _i ^π	E _γ [†]	I _γ [†]	E _f	J _f ^π	Mult.	α [@]	Comments
662.06	3/2 ⁻	662.06 6	100	0.0	7/2 ⁻			
1137.04	1/2 ⁻	475.0 2	100	662.06	3/2 ⁻			
1354.50	9/2 ⁻	1354.52 9	100	0.0	7/2 ⁻			
1368.71	13/2 ⁺	1368.7 2	100	0.0	7/2 ⁻	[E3]	0.00206	B(E3)(W.u.)=21.6 12 α(K)=0.001738 25; α(L)=0.000243 4; α(M)=5.10×10 ⁻⁵ 8 α(N)=1.128×10 ⁻⁵ 16; α(O)=1.81×10 ⁻⁶ 3; α(P)=1.300×10 ⁻⁷ 19; α(IPF)=1.293×10 ⁻⁵ 19

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Adopted Levels, Gammas (continued)

$\gamma(^{141}\text{Ce})$ (continued)							
$E_i(\text{level})$	J_i^π	E_γ^\dagger	I_γ^\dagger	E_f	J_f^π	Mult.	Comments
1378.0	(9/2 ⁻ ,11/2 ⁻)	1378.0 [‡] 2	100	0.0	7/2 ⁻		
1497.00	5/2 ⁻	834.8 4	11 4	662.06	3/2 ⁻		
		1497.0 1	100 6	0.0	7/2 ⁻		
1626.5	(3/2) ⁺	964.0 8	100	662.06	3/2 ⁻		
1693.31	11/2 ⁻	324.6 4	1.8 7	1368.71	13/2 ⁺		
		1693.3 1	100 6	0.0	7/2 ⁻		
1739.01	7/2 ⁻	1739.0 1	100	0.0	7/2 ⁻		
1808.7	3/2 ⁻	672.0 8	48 14	1137.04	1/2 ⁻		
		1146.6 3	100 17	662.06	3/2 ⁻		
		1808.4 7	59 17	0.0	7/2 ⁻		
1812.7	5/2 ⁻	1151.0 [‡] 1	6 2	662.06	3/2 ⁻		
		1811.0 [‡] 2	100 14	0.0	7/2 ⁻		
1943.9		589.9 6	30 15	1354.50	9/2 ⁻		
		1943.7 3	100 15	0.0	7/2 ⁻		
1961.5	15/2 ⁽⁺⁾	592.8 [#]	100	1368.71	13/2 ⁺	D	Mult.: from (α ,n γ).
1994.3	(1/2 ⁻)	1332.2 4	100	662.06	3/2 ⁻		
2030.22		2030.2 2	100	0.0	7/2 ⁻		
2049.3		694.9 6	50 31	1354.50	9/2 ⁻		
		2049.2 3	100 16	0.0	7/2 ⁻		
2114.5	(5/2) ⁻	1454.0 [‡] 2	12 1	662.06	3/2 ⁻		
		2113.0 [‡] 2	100 8	0.0	7/2 ⁻		
2165	11/2 ⁻ ,9/2 ⁻	791.0 ^{‡&}		1378.0	(9/2 ⁻ ,11/2 ⁻)		
2165.0	3/2 ⁻	791.0 ^{‡&} 3	23 23	1378.0	(9/2 ⁻ ,11/2 ⁻)		791 γ from 3/2 ⁻ to (9/2 ⁻ ,11/2 ⁻) is highly unlikely; it is possible that this γ originates from 2165, 11/2 ⁻ ,9/2 ⁻ level in which case in (d,p),(d,p γ) dataset the 2165 doublet is rather observed.
		1502.0 [‡] 2	30 21	662.06	3/2 ⁻		
		2166.0 [‡] 2	100 19	0.0	7/2 ⁻		
2171.1	9/2 ⁻	2171.1 3	100	0.0	7/2 ⁻		
2174.02	5/2 ⁻	435.0 8	4 3	1739.01	7/2 ⁻		
		547.1 5	6 3	1626.5	(3/2) ⁺		
		676.8 5	8 3	1497.00	5/2 ⁻		
		1512.1 2	56 5	662.06	3/2 ⁻		
		2173.9 3	100 12	0.0	7/2 ⁻		
2189.6	3/2 ⁻	692.5 4		1497.00	5/2 ⁻		
		1052.6 4	100 22	1137.04	1/2 ⁻		
		1527.6 6	78 17	662.06	3/2 ⁻		
2207.40	(7/2 ⁺)	581.1 5	15 6	1626.5	(3/2) ⁺		
		710.4 2	40 8	1497.00	5/2 ⁻		
		853.0 3	40 8	1354.50	9/2 ⁻		
		2207.3 2	100 8	0.0	7/2 ⁻		
2207.5	17/2 ⁽⁺⁾	246 [#]	100	1961.5	15/2 ⁽⁺⁾	D	Mult.: from (α ,n γ).
2266.94	(5/2 ⁺)	1604.8 2	21 2	662.06	3/2 ⁻		
		2267.0 2	100 6	0.0	7/2 ⁻		
2272.5	(19/2)	65 [#]	100	2207.5	17/2 ⁽⁺⁾	D	Mult.: based on RUL.
2328.9	7/2 ⁻	2328.9 11	100	0.0	7/2 ⁻		
2336.1	3/2 ⁻	839.4 ^{&} 6		1497.00	5/2 ⁻		E_γ : from (n, γ) (1970Ge03), not observed in (d,p γ) (1976Pi15). I_γ : I(839 γ)/I(1674 γ)=1.2 (n, γ). E_γ : from (d,p γ) (1976Pi15), not observed in
		1197 ^{&} 2		1137.04	1/2 ⁻		

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Adopted Levels, Gammas (continued)

$\gamma(^{141}\text{Ce})$ (continued)						
$E_i(\text{level})$	J_i^π	E_γ^\dagger	I_γ^\dagger	E_f	J_f^π	Comments
						(n, γ) (1970Ge03).
2336.1	3/2 ⁻	1673.9 10		662.06	3/2 ⁻	I_γ : I(1197 γ)/I(1674 γ)=4.1 (1976Pi15).
2405.9	(5/2 ⁻)	592 [‡] & 2	<2.6	1812.7	5/2 ⁻	E_γ : from (d,p γ) (1976Pi15); observed in (n, γ) (1970Ge03).
		912 [‡] 2	19 3	1497.00	5/2 ⁻	
		1264 [‡] & 2	2.3 15	1137.04	1/2 ⁻	
		1744 [‡] 1	100 14	662.06	3/2 ⁻	
		2402 [‡] 2	12 3	0.0	7/2 ⁻	
2410.8	1/2 ⁻	602 2	9 9	1808.7	3/2 ⁻	
		1274.0 15	9 6	1137.04	1/2 ⁻	
		1748.7 5	100 15	662.06	3/2 ⁻	
2426.0	3/2 ⁻	617.1 6	16 3	1808.7	3/2 ⁻	
		1288.9 10	100 [‡] 10	1137.04	1/2 ⁻	
		1764.4 10	23 [‡] 6	662.06	3/2 ⁻	
2523.0	1/2 ⁻ ,3/2 ⁻	1386.0 4	100	1137.04	1/2 ⁻	

[†] From ^{141}La β^- decay and (n, γ) data, unless given otherwise.

[‡] From $^{140}\text{Ce}(\text{d,p}),(\text{d,p}\gamma)$ dataset.

From $^{139}\text{La}(^7\text{Li},\alpha\text{n}\gamma)$ dataset.

@ [Additional information 3](#).

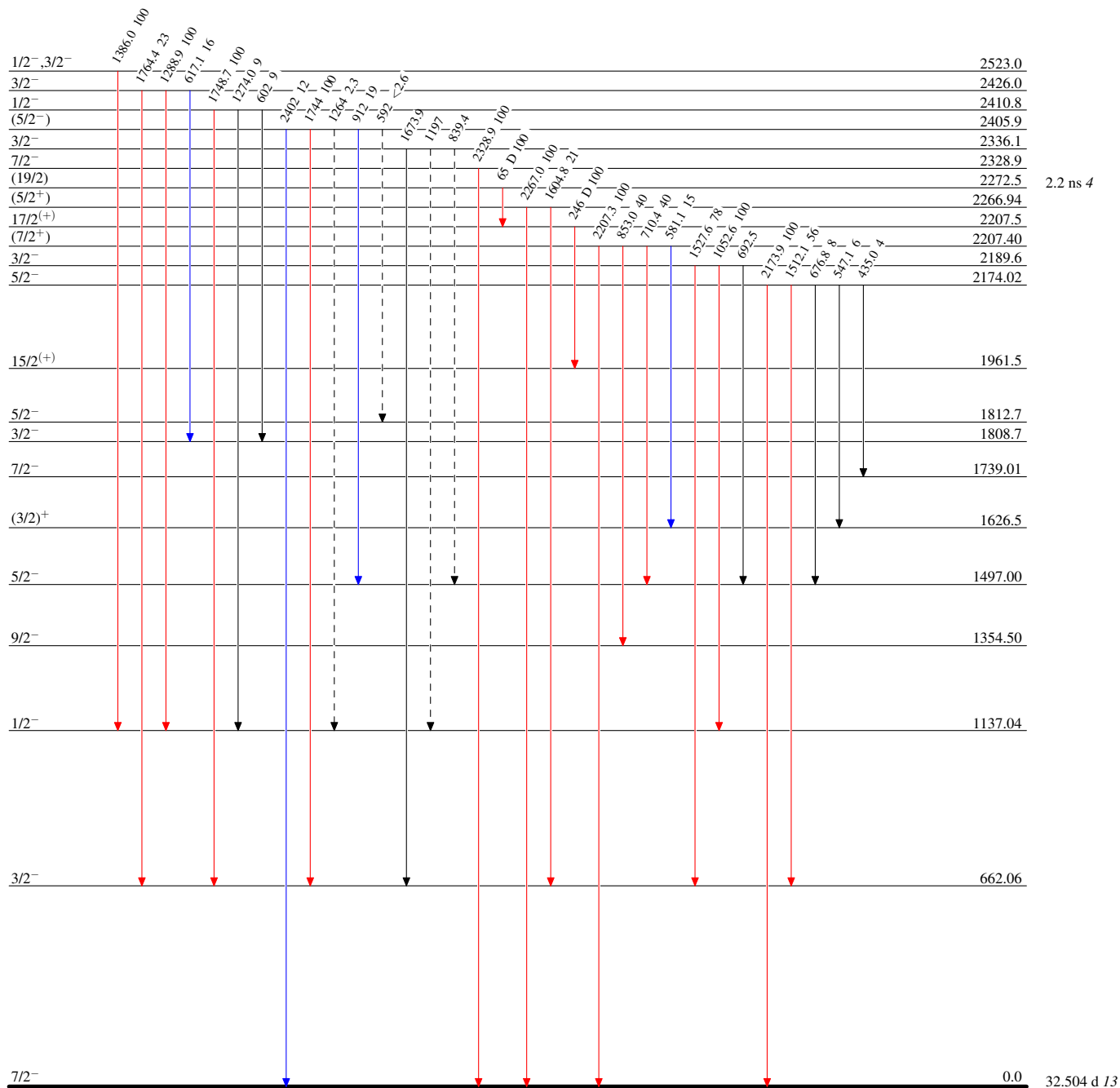
& Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

Legend

Level Scheme
 Intensities: Type not specified

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- - - - - → γ Decay (Uncertain)



$^{141}_{58}\text{Ce}_{83}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified

Legend

- ▶ $I_\gamma < 2\% \times I_\gamma^{max}$
- ▶ $I_\gamma < 10\% \times I_\gamma^{max}$
- ▶ $I_\gamma > 10\% \times I_\gamma^{max}$
- - -▶ γ Decay (Uncertain)

