^{144}Sm(α,2nγ) 1986Ya06,1972Ko42,2010CaZZ

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Yu. Khazov, A. Rodionov and G. Shulyak	NDS 136, 163 (2016)	14-Jul-2016

2006CaZX,2010Ca08,2010CaZZ: ^{144}Sm(α,2n), E=26.3 MeV. Measured Eγ, Iγ, $\gamma\gamma$ coin, $\gamma(\theta)$, γ(lin pol). ^{146}Gd; deduced levels, multipolarity, J^π, multiplet structures, and two-phonon octupole excitations. Tandem, an array of 9 Ge detectors (5 of them with anti-Compton shielding), EUROBALL CLUSTER detector of 7 Ge detectors used as Compton polarimeter.

1986Ya06,1987Ya13,1979Kl04: ^{144}Sm(α,2nγ), E=25-30 MeV; measured Eγ, Iγ, $\gamma\gamma$ coin, $\gamma(\theta)$, γ(t), ce, δ, $T_{1/2}$. ^{146}Gd; deduced levels, J^π, configurations. Ge detectors, β spectrometers, shell model treatments.

1972Ko42: ^{144}Sm(α,2nγ), E=32 MeV; measured Eγ, Iγ, $\gamma\gamma$ coin, $\gamma(\theta)$, $T_{1/2}$. ^{146}Gd; deduced levels, J^π. Cyclotron, Ge(Li) detectors.

Others: 1971Sp10, 1973Kr10, 1979Ha15, 1978Og03, 1998FuZO.

The level scheme was proposed by 1986Ya06 and 2010CaZZ on the basis of γ, ce, $\gamma\gamma$ coin, $\gamma(\theta)$, γ(lin pol) measurements. Detailed probable shell-model configurations for many levels are given in both papers.

^{146}Gd Levels

E(level)[†]	J^π[‡]	$T_{1/2}$	Comments
0.0	0$^+$	48.27 d *9*	$T_{1/2}$: from 'Adopted Levels'.
1579.44[a] *6*	3$^-$	1.06 ns *12*	$T_{1/2}$: weighted average from $\gamma\gamma$(t) and e$^-\gamma$(t) in (α,2nγ) and (α,6n) reactions (1978Kl04). g: +1.44 *22*, by TIPAD method (1998FuZO).
1971.99 *7*	2$^+$		
2164.72 *12*	0$^+$		
2611.55 *8*	4$^+$		
2658.03[a] *9*	5$^-$		
2967.49 *11*	4$^+$		
2982.11[a] *10*	7$^-$	7.2 ns *4*	$T_{1/2}$: Others: 13.5 ns *35* (1972Ko42), 9.1 ns *20* (1973Kr10).
2985.9 *6*	2$^+$		
2996.52[a] *10*	4$^-$		
3019.80 *21*	0$^+$		
3031.12 *10*	3$^+$		
3098.95[a] *11*	6$^-$		
3182.55[a] *12*	8$^-$		
3185.87 *12*	2$^+$		
3232.4 *4*	2$^+$		
3287.25 *11*	3$^+$		
3290.43[b] *19*	7$^-$		
3293.63[b] *12*	8$^-$	<300 ps	$T_{1/2}$: from ce(t),γ(t) (1979Kl04).
3313.10[b] *12*	5$^-$		
3356.7 *5*	2$^+$		
3363.87 *11*	4		
3380.79 *20*	2$^+$		
3384.16[b] *11*	6$^-$		
3388.70[b] *13*	3,(1)		
3388.7[b] *4*	2,4		
3411.80 *10*	4$^+$		
3416.57 *13*	4$^+$		
3423.19 *20*	3$^-$		
3428.32[b] *12*	9$^-$	<300 ps	$T_{1/2}$: from ce(t),γ(t) (1979Kl04).
3436.27 *14*	4$^+$		
3456.46 *21*	4$^+$		E(level): from 2010CaZZ. Other (1986Ya06): doublet 3456 (4$^-$) (or (5$^-$) in table 1, possible misprint) and 3456.9, 6$^+$ in table 2.
3461.2 *3*	3$^-$,1$^-$,5$^-$		

Continued on next page (footnotes at end of table)

^{144}Sm(α,2nγ) 1986Ya06,1972Ko42,2010CaZZ (continued)

^{146}Gd Levels (continued)

E(level)[†]	J^{π}[‡]	$T_{1/2}$	Comments
3464.03 *18*	5^-		
3478.5 *10*			
3481.9 *6*	(3^+)		
3484.2 *9*	0^+		
3484.74 *11*	6^+[&]		
3547.5 *8*	2^+		
3563.00 *16*	$4^+,2^+$		
3585.5 *10*	4,2		
3640.4 *8*	0^+		
3656.28 *12*	3		
3660.03 *14*	6^+		
3686.7 *8*	5^-		
3730.0 *20*			
3744.2 *7*	$(2^+,3^-)$		
3761.5 *6*	(4^+)		
3779.29 *14*	8^+		
3783.76 *13*	$3^+,5^+$		
3789 *3*	$(2^-,3^-,4^-)$		
3853.57 *16*	(3^-)		
3854.21 *13*	7^-		
3864.68 *14*	10^+	<300 ps	$T_{1/2}$: from ce(t),γ(t) (1979Kl04).
3866.66 *19*	(5^-)		
3907.9 *3*	(3^-)		
3947.10 *18*	(6^+)		
3973.5 *10*	(3^-)		
3987.5 *10*			
4006.7 *5*	(4^+)		
4026.67 *22*	6,8		
4076.8 *6*			
4107.53 *14*	8^+		
4113.5 *10*			
4118.2 *4*			
4122.6 *10*	$5^-,3^-$		
4131.1 *10*	$3^+,5^+$		
4152.5 *10*	2,4		
4166.5 *4*	4,6		
4179.46 *21*	(6^-)		
4216.3 *5*	$2^+,4^+$		
4230.5 *20*	5^-		
4248.46 *23*	(9)		
4259.7 *5*			
4286.5 *20*			
4299.8 *3*	2^+		
4318.91 *23*	$6^-,7^-,8^-$		
4326.6 *20*	3,5		
4341.5 *20*	(4^-)		
4354.95 *14*	$5^-,6^+$		
4372.5 *20*	(4^+)		
4376.0 *10*	(4^+)		
4389.6 *6*	5,7		
4399.4 *3*	$5^-,7^-$		
4416.8 *4*	$10^-,8^-$		J^{π}: most likely, because of mult=M1 or E2 for the 1123.2 keV transition to 8^-. Value $J^{\pi}=10^+$ in 2010CaZZ is in contradiction with general rules presented in the table 2.3 of the same paper; hence, it is possible misprint.
4459.05 *21*	7,9		
4484.2 *10*	(4^+)		

Continued on next page (footnotes at end of table)

^{144}Sm(α,2nγ) 1986Ya06,1972Ko42,2010CaZZ (continued)

^{146}Gd Levels (continued)

E(level)[†]	Jπ[‡]	E(level)[†]	Jπ[‡]	E(level)[†]	Jπ[‡]	E(level)[†]	Jπ[‡]
4484.8 *4*	(11^-)	4645.3[#] *4*	$11^{(-)}$	4880.1 *4*	$10^-,8^-$	5350.3[#] *4*	(12)
4501.7 *3*	10	4666.74 *16*	(12^+)	4898.3 *3*	9,7	5447.4[@] *5*	
4520.6 *10*		4721 *3*	4^-	4942.6 *10*		5791.2[@] *5*	
4529.22 *23*		4729.54 *23*	$(9^+,7^+)$	5056.2 *5*		5894.2[@] *6*	
4532.6 *20*	3,5	4780.50 *24*		5094.6 *3*	11^+	6120.0[@] *7*	
4541.10 *15*	10^+	4782.1 *10*	8,6	5164.38 *25*	$11^+,9^+$		
4580.3 *8*	7	4802.0 *10*		5277.0[#] *4*			
4608.3 *7*	$8,10^-$	4847.6 *20*	9,7	5320.4?[#] *5*			

[†] From a least-squares fit to Eγ's; normalized χ^2=0.5.

[‡] From 2010CaZZ, except as noted.

[#] Introduced by 1972Ko42.

[@] Introduced by 1980BrZQ from (α,6nγ).

[&] Interpreted as two-phonon excitation by 2010Ca08, 2006CaZX; 3484.7 keV, 6^+ → 1579.4 keV, 3^- → g.s., 0^+, E3-E3 cascade discovered.

[a] Band(A): Sequence of the levels with probable configuration $\pi h_{11/2} d^{-1}_{5/2}$ (1986Ya06,2010CaZZ).

[b] Band(B): Sequence of the levels with probable configuration $\pi h_{11/2} g^{-1}_{7/2}$. The J=9-5 level assignments to the multiplet are the same in 1986Ya06 and 2010CaZZ but differ for J=4 and 3.

γ(^{146}Gd)

Anisotropy ratio R=Iγ(40°)/Iγ(90°); if R>1 then A_2>0, and if R<1 then A_2<0 (2010CaZZ).
pol is a γ linear polarization value.

Eγ[†]	Iγ[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[‡]	δ[#d]	α[c]	Comments
103.0[@] *3*	3.1[@]	5894.2		5791.2		D[&]			A_2=−0.31 *10*.
[x]105.5[@] *3*	2.5[@]								A_2=+0.04 *13*, A_4=+0.17 *21*.
111.3 *2*	9.0 *5*	3293.63	8^-	3182.55	8^-	M1+E2	<0.5	1.50 *4*	α(L)exp=0.177 *14*; α(M)exp=0.041 *4* (1979Kl04); α(L)exp=0.17 *2* (1986Ya06) α(K)=1.21 *5*; α(L)=0.23 *5*; α(M)=0.050 *12* α(N)=0.0115 *25*; α(O)=0.0017 *3*; α(P)=8.8×10^{-5} *6* A_2=+0.41 *2*, A_4=+0.02 *2*, ΔJ=0, R=0.77 *4*.
116.7 *2*	0.22 *6*	3098.95	6^-	2982.11	7^-	(M1)		1.295	α(K)=1.094 *17*; α(L)=0.1576 *24*; α(M)=0.0343 *5* α(N)=0.00788 *12*; α(O)=0.001223 *19*; α(P)=8.15×10^{-5} *12* Mult.: from ε decay of 5^- isomer of ^{146}Tb (1981StZO), placed between 3099, 6^- and 2982, 7^- levels.
125.9 *2*	0.09 *3*	4666.74	(12^+)	4541.10	10^+	[&]			A_2=−0.32 *19*, A_4=+0.06 *25*; R=0.7 *3*. Mult.: apparently, mult.=D (ΔJ=1) from γ(θ), R value has a large uncertainty, mult.=D contradicts to 10+→12^+ transition.
134.70 *7*	5.4 *5*	3428.32	9^-	3293.63	8^-	M1+E2	0.07	0.862 *13*	α(L)exp=0.098 *10*; α(M)exp=0.033 *12* (1979Kl04); α(L)exp=0.11 *1* (1986Ya06) α(K)=0.727 *11*; α(L)=0.1056 *15*; α(M)=0.0230 *4* α(N)=0.00528 *8*; α(O)=0.000818 *12*; α(P)=5.41×10^{-5} *8* A_2=−0.35 *2*, A_4=−0.02 *2*, R=0.77 *9*.
[x]159.2[@] *3*	1.1[@]								E_γ: perhaps, γ do not belong to (α,2nγ) reaction.
[x]168.8[@] *3*	1.0[@]								E_γ: perhaps, γ do not belong to (α,2nγ) reaction.
192.7 *1*	0.04 *1*	2164.72	0^+	1971.99	2^+	E2		0.251	α(K)=0.1731 *25*; α(L)=0.0608 *9*; α(M)=0.01403 *20* α(N)=0.00315 *5*; α(O)=0.000432 *7*; α(P)=9.85×10^{-6} *14* Mult.: R=0.69 *24*; 0+→2^+ transition in ε decay of^{146}Tb, 1^+ (1989KlZY).
200.45 *7*	13.1 *6*	3182.55	8^-	2982.11	7^-	M1+E2	0.1	0.284	α(K)exp=0.22 *5*; α(L)exp=0.035 *4* α(K)=0.240 *4*; α(L)=0.0345 *5*; α(M)=0.00751 *11* α(N)=0.001727 *25*; α(O)=0.000268 *4*; α(P)=1.779×10^{-5} *25* A_2=+0.02 *1*, A_4=+0.04 *2*, R=1.10 *7*, pol=−0.27 *10*.
[x]208.2[@] *3*	[@]								A_2=−0.08 *2*, A_4=−0.18 *3*.
[x]210.8[@] *3*	0.8[@]								
225.8[@] *3*	3.6[@]	6120.0		5894.2		D[&]			A_2=−0.69 *9*, A_4=+0.16 *10*.
245.74 *17*	0.21 *3*	3428.32	9^-	3182.55	8^-	M1+E2	0.9	0.1408	α(K)=0.1136 *16*; α(L)=0.0212 *3*; α(M)=0.00473 *7* α(N)=0.001077 *16*; α(O)=0.0001589 *23*; α(P)=7.89×10^{-6} *12* α(K)exp=0.13 *4* (1979Kl04). A_2=−1.03 *10*, A_4=+0.27 *12* (1979Kl04), R=0.17 *4*, pol=+0.1 *3*.
[x]247.5[@] *3*	1.2[@]					D			A_2=−0.23 *11*, A_4=+0.24 *15*.

$^{144}Sm(\alpha,2n\gamma)$ 1986Ya06,1972Ko42,2010CaZZ (continued)

$\gamma(^{146}Gd)$ (continued)

E_γ[†]	I_γ[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[‡]	δ[#d]	α[c]	Comments
[x]271.8[@] *3*	1.2[@]								
[x]275.5[@] *3*	5.5[@]								A_2=+0.08 *2*, A_4=−0.32 *33*.
285.20 *14*	0.20 *3*	3384.16	6^-	3098.95	6^-	M1+E2		0.090 *20*	α(K)exp=0.075 *25* α(K)=0.073 *20*; α(L)=0.01319 *21*; α(M)=0.00293 *10* α(N)=0.000668 *17*; α(O)=9.9×10^{-5} *3*; α(P)=5.1×10^{-6} *18* A_2=−0.03 *15*, A_4=+0.22 *21*, R=1.17 *20*, pol=−0.49 *20*.
308.29 *17*	4.5 *3*	3290.43	7^-	2982.11	7^-	M1		0.0889	α(K)exp=0.066 *25* α(K)=0.0753 *11*; α(L)=0.01063 *15*; α(M)=0.00231 *4* α(N)=0.000531 *8*; α(O)=8.25×10^{-5} *12*; α(P)=5.56×10^{-6} *8* A_2=+0.40 *3*, A_4=+0.04 *3* (ΔJ=0), R=1.44 *9*, pol=+0.49 *19*.
311.5 *1*	9.0 *5*	3293.63	8^-	2982.11	7^-	M1+E2	0.16	0.0857	α(K)exp=0.084 *20*; α(L)exp=0.011 *4* α(K)=0.0725 *11*; α(L)=0.01032 *15*; α(M)=0.00224 *4* α(N)=0.000516 *8*; α(O)=8.00×10^{-5} *12*; α(P)=5.34×10^{-6} *8* A_2=−0.34 *1*, A_4=+0.05 *2*, R=0.63 *6*, pol=−0.36 *13*.
324.05 *7*	45.9 *22*	2982.11	7^-	2658.03	5^-	E2		0.0476	α(K)exp=0.037 *3*; α(L)exp=0.007 *3* α(K)=0.0369 *6*; α(L)=0.00838 *12*; α(M)=0.00189 *3* α(N)=0.000428 *6*; α(O)=6.12×10^{-5} *9*; α(P)=2.34×10^{-6} *4* A_2=+0.33 *1*, A_4=−0.10 *4*, R=1.49 *10*, pol=+0.51 *14*.
[x]334.4[@] *3*	0.5[@]								
338.2 *4*	0.03 *1*	2996.52	4^-	2658.03	5^-	[M1]		0.0696	α(K)=0.0590 *9*; α(L)=0.00830 *12*; α(M)=0.00180 *3* α(N)=0.000414 *6*; α(O)=6.44×10^{-5} *10*; α(P)=4.35×10^{-6} *7*
357.6 *3*	0.21 *4*	3388.7	2,4	3031.12	3^+	D[&]			R=0.52 *14*.
[x]358.0[@] *3*	5.0[@]								
[x]360.2[@] *3*	1.1[@]								
[x]379.8[@] *3*	2.3[@]								
380.9 *3*	0.28 *5*	3411.80	4^+	3031.12	3^+	M1[&]		0.0510	α(K)=0.0432 *7*; α(L)=0.00606 *9*; α(M)=0.001313 *19* α(N)=0.000302 *5*; α(O)=4.70×10^{-5} *7*; α(P)=3.18×10^{-6} *5* R=0.65 *16*, pol=−0.07 *24*, ΔJ=1.
381.7 *3*	0.15 *6*	3866.66	(5^-)	3484.74	6^+	(E1)[&]		0.00882	α(K)=0.00751 *11*; α(L)=0.001028 *15*; α(M)=0.000222 *4* α(N)=5.07×10^{-5} *8*; α(O)=7.74×10^{-6} *11*; α(P)=4.87×10^{-7} *7* R=0.9 *5*, pol=+0.2 *9*.
[x]385.5[@] *3*	1.7[@]								
402.08 *9*	0.49 *7*	3384.16	6^-	2982.11	7^-	M1		0.0443	α(K)=0.0376 *6*; α(L)=0.00526 *8*; α(M)=0.001139 *16* α(N)=0.000262 *4*; α(O)=4.08×10^{-5} *6*; α(P)=2.76×10^{-6} *4* A_2=−0.39 *17*, A_4=+0.10 *25*, R=0.68 *14*, pol=−0.20 *25*.
415.3 *1*	0.33 *9*	3411.80	4^+	2996.52	4^-	E1		0.00722	α(K)=0.00615 *9*; α(L)=0.000838 *12*; α(M)=0.000181 *3* α(N)=4.14×10^{-5} *6*; α(O)=6.33×10^{-6} *9*; α(P)=4.01×10^{-7} *6* Mult.: from R=1.2 *5*, pol=−0.6 *5*, ΔJ=0. A_2=+0.53 *22*, A_4=+0.10 *32*. α(K)exp=0.02 (1986Ya06): great value for the E1 multipolarity is likely a typo.

$^{146}_{64}Gd_{82}$-5

γ(^{146}Gd) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[‡]	α[c]	Comments
[x]433.5[@] *3*	2.2[@]					D		A_2=−0.27 *19*.
436.30 *7*	4.38 *22*	3864.68	10$^+$	3428.32	9$^-$	E1	0.00643	α(K)exp≤0.007; α(K)exp=0.0062 *10* (1979Kl04) α(K)=0.00549 *8*; α(L)=0.000745 *11*; α(M)=0.0001606 *23* α(N)=3.68×10^{-5} *6*; α(O)=5.63×10^{-6} *8*; α(P)=3.58×10^{-7} *5* A_2=−0.27 *2*, A_4=+0.05 *4*, R=0.63 *5*, pol=+0.39 *14*.
440.9[@] *3*	3.8[@]	5791.2		5350.3	(12)	(D)		A_2=−0.45 *13*, A_4=+0.22 *17* (for doublet from 5791 and 3099 levels).
440.95 *7*	4.58 *22*	3098.95	6$^-$	2658.03	5$^-$	M1	0.0349	α(K)exp=0.031 *5*; α(L)exp=0.0047 *10* α(K)=0.0296 *5*; α(L)=0.00413 *6*; α(M)=0.000895 *13* α(N)=0.000206 *3*; α(O)=3.20×10^{-5} *5*; α(P)=2.17×10^{-6} *3* A_2=+0.07 *2*, A_4=+0.06 *3*, R=1.07 *7*, pol=−0.35 *11*.
446.19 *10*	0.47 *5*	3428.32	9$^-$	2982.11	7$^-$	E2	0.0189	α(K)exp=0.013 *6* α(K)=0.01525 *22*; α(L)=0.00288 *4*; α(M)=0.000643 *9* α(N)=0.0001462 *21*; α(O)=2.14×10^{-5} *3*; α(P)=1.011×10^{-6} *15* A_2=+0.39 *13*, A_4=−0.02 *2*, R=1.07 *16*, pol=+0.24 *19*.
483.1 *2*	0.22 *5*	3947.10	(6$^+$)	3464.03	5$^-$	E1	0.00509	α(K)=0.00435 *6*; α(L)=0.000587 *9*; α(M)=0.0001265 *18* α(N)=2.90×10^{-5} *4*; α(O)=4.44×10^{-6} *7*; α(P)=2.85×10^{-7} *4* R=0.75 *24*, pol=+0.5 *5*.
[x]497.4[@] *3*	0.5[@]							
502.6 *1*	0.32 *4*	3484.74	6$^+$	2982.11	7$^-$	E1	0.00466	α(K)=0.00398 *6*; α(L)=0.000536 *8*; α(M)=0.0001155 *17* α(N)=2.65×10^{-5} *4*; α(O)=4.06×10^{-6} *6*; α(P)=2.62×10^{-7} *4* R=0.67 *12*, pol=+0.36 *24*.
[x]527.0[@] *3*	0.5[@]							
[x]535.2[@] *3*	1.3[@]							
[x]571.0[@] *3*	0.5[@]							
[x]590.2[@] *3*	1.1[@]							
593.0[@] *3*	13[@]	5094.6	11$^+$	4501.7	10			
639.6 *1*	0.20 *2*	2611.55	4$^+$	1971.99	2$^+$	E2	0.00750	α(K)=0.00621 *9*; α(L)=0.001011 *15*; α(M)=0.000222 *4* α(N)=5.08×10^{-5} *8*; α(O)=7.63×10^{-6} *11*; α(P)=4.24×10^{-7} *6* R=1.65 *23*.
654.6 *6*	0.40 *20*	3640.4	0$^+$	2985.9	2$^+$	E2	0.00709	α(K)=0.00588 *9*; α(L)=0.000950 *14*; α(M)=0.000209 *3* α(N)=4.77×10^{-5} *7*; α(O)=7.17×10^{-6} *11*; α(P)=4.02×10^{-7} *6* Mult.: 0+→2$^+$ transition.
655.08 *10*	1.35 *14*	3313.10	5$^-$	2658.03	5$^-$	M1	0.01283	α(K)exp=0.011 *5* α(K)=0.01091 *16*; α(L)=0.001501 *21*; α(M)=0.000325 *5* α(N)=7.47×10^{-5} *11*; α(O)=1.164×10^{-5} *17*; α(P)=7.94×10^{-7} *12* A_2=+0.45 *10*, A_4=+0.10 *10*, R=1.28 *19*.
671.70 *10*	0.37 *7*	3854.21	7$^-$	3182.55	8$^-$	M1	0.01205	α(K)exp=0.013 *4* α(K)=0.01026 *15*; α(L)=0.001409 *20*; α(M)=0.000305 *5* α(N)=7.02×10^{-5} *10*; α(O)=1.093×10^{-5} *16*; α(P)=7.46×10^{-7} *11* A_2=−0.24 *18*, A_4=+0.25 *26*, R=0.79 *21*.
675.70 *9*	0.46 *5*	3287.25	3$^+$	2611.55	4$^+$	M1	0.01188	α(K)exp=0.014 *6*

$^{146}_{64}$Gd$_{82}$-6

γ(^{146}Gd) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	α[c]	Comments
								α(K)=0.01011 *15*; α(L)=0.001389 *20*; α(M)=0.000300 *5* α(N)=6.91×10^{-5} *10*; α(O)=1.076×10^{-5} *15*; α(P)=7.35×10^{-7} *11* A_2=−0.10 *8*, A_4=−0.08 *20*, R=0.89 *10*, pol=+0.26 *23*.
676.3 *2*	0.10 *5*	4541.10	10$^+$	3864.68	10$^+$	[a]		R=2.6 *7*.
697.0[@f] *3*	5.2[@]	5791.2		5094.6	11$^+$			E_γ: marked in 1972Ko42 as pertinent to ^{72}Ge(n,n′γ).
701.51 *18*	0.10 *2*	3313.10	5$^-$	2611.55	4$^+$	E1	0.00228	α(K)=0.00195 *3*; α(L)=0.000258 *4*; α(M)=5.55×10^{-5} *8* α(N)=1.274×10^{-5} *18*; α(O)=1.97×10^{-6} *3*; α(P)=1.298×10^{-7} *19* R=0.74 *21*, pol=+0.5 *6*.
706.0 *2*	0.10 *2*	3363.87	4	2658.03	5$^-$	D[&]		R=0.56 *16*.
726.10 *9*	1.57 *8*	3384.16	6$^-$	2658.03	5$^-$	M1	0.00994	α(K)exp=0.0080 *16* α(K)=0.00847 *12*; α(L)=0.001160 *17*; α(M)=0.000251 *4* α(N)=5.77×10^{-5} *8*; α(O)=8.99×10^{-6} *13*; α(P)=6.15×10^{-7} *9* A_2=−0.46 *7*, A_4=+0.00 *9*, R=0.70 *5*.
^{x}728.0[@] *3*	5.7[@]							A_2=−0.70 *25*.
736.0 *5*	0.06 *3*	4026.67	6,8	3290.43	7$^-$	D[&]		R=0.8 *5*.
^{x}743.0[@] *3*	1.1[@]							
752.2 *2*	0.05 *1*	3363.87	4	2611.55	4$^+$	[a]		R=2.3 *7*.
755.17 *19*	0.18 *3*	3854.21	7$^-$	3098.95	6$^-$	D[&]		A_2<0, R=0.78 *13*.
^{x}770.8[@] *3*	1.6[@]							
780.8[@] *3*	1.3[@]	4645.3	11$^{(-)}$	3864.68	10$^+$			
^{x}783.8[@] *3*	1.8[@]							
797.18 *10*	2.72 *24*	3779.29	8$^+$	2982.11	7$^-$	E1	1.76×10^{-3}	α(K)exp=0.0025 *10* α(K)=0.001505 *21*; α(L)=0.000198 *3*; α(M)=4.27×10^{-5} *6* α(N)=9.79×10^{-6} *14*; α(O)=1.513×10^{-6} *22*; α(P)=1.007×10^{-7} *14* A_2=−0.24 *4*, A_4=−0.02 *6*, R=0.57 *7*, pol=+0.5 *3*.
798.69 *17*	3.2 *3*	3456.46	4$^+$	2658.03	5$^-$	E1	1.75×10^{-3}	α(K)exp=0.0021 *10* α(K)=0.001500 *21*; α(L)=0.000198 *3*; α(M)=4.25×10^{-5} *6* α(N)=9.75×10^{-6} *14*; α(O)=1.507×10^{-6} *22*; α(P)=1.003×10^{-7} *14* A_2=−0.32 *12*, A_4=+0.12 *20*, R=0.60 *9*, pol=+0.3 *3*.
800.2 *1*	0.14 *2*	3411.80	4$^+$	2611.55	4$^+$	[a]		Mult.: R=1.23 *18*; ΔJ=0.
802.0[e] *1*	0.86 *20*	4666.74	(12$^+$)	3864.68	10$^+$	[a]		A_2=+0.56 *15*, A_4=+0.25 *23*; R=1.8 *6*.
802.0[e@] *3*	1.0[@] *5*	5447.4		4645.3	11$^{(-)}$			I_γ: 5.3 (1972Ko42). A_2=+0.56 *15*, A_4=+0.25 *23*.
804.9 *2*	0.06 *2*	3416.57	4$^+$	2611.55	4$^+$	M1	0.00773	α(K)=0.00658 *10*; α(L)=0.000899 *13*; α(M)=0.000194 *3* α(N)=4.47×10^{-5} *7*; α(O)=6.97×10^{-6} *10*; α(P)=4.77×10^{-7} *7* R=1.0 *5*, pol=+0.5 *9*, ΔJ=0.
822.6 *2*	0.08 *2*	3853.57	(3$^-$)	3031.12	3$^+$			
824.6 *2*	0.06 *2*	3436.27	4$^+$	2611.55	4$^+$	[a]		Mult.: R=1.6 *8*; ΔJ=0.
826.7 *1*	2.05 *14*	3484.74	6$^+$	2658.03	5$^-$	E1	1.64×10^{-3}	α(K)=0.001401 *20*; α(L)=0.000184 *3*; α(M)=3.96×10^{-5} *6* α(N)=9.10×10^{-6} *13*; α(O)=1.406×10^{-6} *20*; α(P)=9.38×10^{-8} *14* R=0.84 *8*, pol=+0.46 *19*.

$^{146}_{64}$Gd$_{82}$-7

γ(^{146}Gd) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[‡]	α[c]	Comments
848.1 *2*	0.37 *4*	3947.10	(6$^+$)	3098.95	6$^-$	[a]		R=1.32 *22*.
872.00 *21*	0.52 *12*	3854.21	7$^-$	2982.11	7$^-$	M1	0.00636	α(K)exp=0.0059 *11* α(K)=0.00542 *8*; α(L)=0.000738 *11*; α(M)=0.0001594 *23* α(N)=3.67×10^{-5} *6*; α(O)=5.72×10^{-6} *8*; α(P)=3.92×10^{-7} *6* A_2=−0.03 *18*, A_4=+0.03 *25*, R=1.1 *3*, pol=+0.5 *8*.
876.7 *3*	0.08 *2*	3907.9	(3$^-$)	3031.12	3$^+$	[a]		R=1.6 *5*.
924.87 *10*	0.58 *10*	4107.53	8$^+$	3182.55	8$^-$	E1	1.32×10^{-3}	α(K)exp≤0.0024 α(K)=0.001128 *16*; α(L)=0.0001478 *21*; α(M)=3.17×10^{-5} *5* α(N)=7.29×10^{-6} *11*; α(O)=1.128×10^{-6} *16*; α(P)=7.57×10^{-8} *11* A_2=+0.42 *20*, A_4=+0.16 *27*, R=1.2 *3*, pol=−0.2 *4*.
951.6 *2*	0.04 *1*	3563.00	4$^+$,2$^+$	2611.55	4$^+$	[a]		R=1.2 *4*.
[x]954.2[@] *3*	0.7[@]					D		A_2=−0.22 *18*, A_4=−0.16 *10*.
[x]962.3[@] *3*	2.4[@]							
977.8 *5*	0.19 *4*	4076.8		3098.95	6$^-$	(D)		R=0.9 *3*, pol=−1.5 *8*.
[x]987.6[@] *3*	1.1[@]							
[x]992.4[@] *3*	2.5[@]							
1002.0 *1*	1.29 *10*	3660.03	6$^+$	2658.03	5$^-$	E1	1.13×10^{-3}	α(K)exp≤0.0013 α(K)=0.000970 *14*; α(L)=0.0001267 *18*; α(M)=2.72×10^{-5} *4* α(N)=6.25×10^{-6} *9*; α(O)=9.68×10^{-7} *14*; α(P)=6.52×10^{-8} *10* A_2=−0.25 *8*, A_4=+0.02 *11*, R=0.83 *9*.
1009.1[f] *3*	0.61 *8*	4107.53	8$^+$	3098.95	6$^-$	D[&]		R=0.77 *13*. Mult.: D from anisotropy contradicts to 8+→6$^-$ transition; transition is not suggested by 1986Ya06.
1014 *1*	<0.49	2985.9	2$^+$	1971.99	2$^+$	D		R=1.2 *6*.
[x]1021.0[@] *3*	1.4[@]							
1030.7 *5*	0.03 *2*	4459.05	7,9	3428.32	9$^-$			
1032.05 *7*	5.9 *5*	2611.55	4$^+$	1579.44	3$^-$	E1	1.07×10^{-3}	α(K)exp=0.0010 *5* α(K)=0.000919 *13*; α(L)=0.0001198 *17*; α(M)=2.57×10^{-5} *4* α(N)=5.90×10^{-6} *9*; α(O)=9.15×10^{-7} *13*; α(P)=6.18×10^{-8} *9* A_2=−0.27 *3*, A_4=+0.05 *4*, R=0.85 *10*, pol=+0.35 *22*.
[x]1039.1[@] *3*	3.9[@]							A_2=−0.22 *22*.
1044.6 *3*	0.07 *2*	3656.28	3	2611.55	4$^+$			
1044.6 *2*	0.54 *7*	4026.67	6,8	2982.11	7$^-$	D[&]		R=0.53 *10*.
1047.8 *2*	0.14 *3*	3019.80	0$^+$	1971.99	2$^+$	E2	0.00250	α(K)=0.00211 *3*; α(L)=0.000303 *5*; α(M)=6.58×10^{-5} *10* α(N)=1.509×10^{-5} *22*; α(O)=2.31×10^{-6} *4*; α(P)=1.463×10^{-7} *21* R=1.0 *3*, pol=+0.2 *6*.
1056.5 *3*	0.15 *4*	4484.8	(11$^-$)	3428.32	9$^-$	[a]		R=1.4 *5*.
1059.14 *9*	0.88 *9*	3031.12	3$^+$	1971.99	2$^+$	M1	0.00399	α(K)exp=0.0043 *10* α(K)=0.00340 *5*; α(L)=0.000460 *7*; α(M)=9.93×10^{-5} *14* α(N)=2.29×10^{-5} *4*; α(O)=3.57×10^{-6} *5*; α(P)=2.45×10^{-7} *4* A_2=−0.25 *15*, A_4=+0.20 *20*, R=0.87 *13*, pol=+0.3 *3*.

$^{144}Sm(\alpha,2n\gamma)$ 1986Ya06,1972Ko42,2010CaZZ (continued)

$\gamma(^{146}Gd)$ (continued)

E_γ[†]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	α[c]	Comments
1065.9 *2*	0.87 *18*	4248.46	(9)	3182.55	8^-	D		R=0.72 *21*.
1073.6 *3*	0.9 *3*	4501.7	10	3428.32	9^-	D[&]		A_2=−0.16 *6*, A_4=−0.19 *9*, R=0.8 *3*.
1078.57 *7*	71 *4*	2658.03	5^-	1579.44	3^-	E2	0.00235	α(K)=0.00199 *3*; α(L)=0.000284 *4*; α(M)=6.17×10^{-5} *9* α(N)=1.414×10^{-5} *20*; α(O)=2.17×10^{-6} *3*; α(P)=1.380×10^{-7} *20* A_2=−0.27 *3*, A_4=+0.05 *4*, R=1.47 *11*, pol=+0.61 *21*.
1100 *1*	0.17 *4*	4131.1	$3^+,5^+$	3031.12	3^+	[a]		R=1.2 *3*, pol=+0.2 *6*.
1112.87 *10*	0.73 *8*	4541.10	10^+	3428.32	9^-	E1	9.35×10^{-4}	α(K)=0.000800 *12*; α(L)=0.0001040 *15*; α(M)=2.23×10^{-5} *4* α(N)=5.13×10^{-6} *8*; α(O)=7.95×10^{-7} *12*; α(P)=5.39×10^{-8} *8*; α(IPF)=2.91×10^{-6} *5* A_2=−0.25 *20*, R=0.58 *9*, pol=+0.4 *3*.
1123.2 *3*	0.12 *2*	4416.8	$10^-,8^-$	3293.63	8^-	[a]		R=1.3 *3*, pol=+0.2 *6*.
1125.60 *21*	0.68 *12*	4107.53	8^+	2982.11	7^-	D		A_2=−0.29 *20*, A_4=+0.21 *28*, R=0.79 *20*, pol=−0.4 *6*.
[x]1130.0[@] *3*	1.6[@]							A_2=+0.39 *22*, A_4=+0.30 *30*.
[x]1141.0[@] *3*	0.5[@]							
1165.4 *5*	0.08 *3*	4459.05	7,9	3293.63	8^-			
1172.2 *1*	0.28 *5*	3783.76	$3^+,5^+$	2611.55	4^+	M1	0.00314	α(K)exp=0.0025 *15* α(K)=0.00267 *4*; α(L)=0.000361 *5*; α(M)=7.78×10^{-5} *11* α(N)=1.79×10^{-5} *3*; α(O)=2.79×10^{-6} *4*; α(P)=1.93×10^{-7} *3*; α(IPF)=3.33×10^{-6} *5* R=0.63 *19*, pol=+0.15 *61*.
1185.2 *5*	0.10 *3*	4216.3	$2^+,4^+$	3031.12	3^+	D[&]		R=0.48 *20*.
1191.5 *4*	0.04 *1*	5056.2		3864.68	10^+			pol=+0.6 *9*.
1197.3 *2*	0.30 *5*	4179.46	(6^-)	2982.11	7^-	D[&]		R=0.97 *23*, pol=+1.0 *8*.
1213.9 *1*	0.14 *2*	3185.87	2^+	1971.99	2^+	(D+Q)		R=0.90 *18*.
1229.7 *3*	0.16 *5*	5094.6	11^+	3864.68	10^+	D+Q[&]		A_2=−0.70 *20*, A_4=+0.30 *30*, R=0.44 *19*.
1244 *2*	0.19 *4*	3853.57	(3^-)	2611.55	4^+	(E1)[&]	8.08×10^{-4}	α(K)=0.000655 *10*; α(L)=8.49×10^{-5} *13*; α(M)=1.82×10^{-5} *3* α(N)=4.18×10^{-6} *6*; α(O)=6.49×10^{-7} *10*; α(P)=4.42×10^{-8} *7*; α(IPF)=4.45×10^{-5} *12* R=0.9 *3*, pol=+0.3 *7*.
1255.2 *2*	0.03 *1*	3866.66	(5^-)	2611.55	4^+	D[&]		R=0.52 *25*.
1256.0 *1*	0.55 *12*	4354.95	$5^-,6^+$	3098.95	6^-	D[&]		R=0.69 *21*.
1260.2 *8*	0.02 *1*	3232.4	2^+	1971.99	2^+	[M1]	0.00266	α(K)=0.00226 *4*; α(L)=0.000304 *5*; α(M)=6.55×10^{-5} *10* α(N)=1.508×10^{-5} *22*; α(O)=2.35×10^{-6} *4*; α(P)=1.623×10^{-7} *23*; α(IPF)=1.489×10^{-5} *25* Mult.: transition between $2+\rightarrow2^+$ levels.
1276.5 *2*	0.06 *1*	4459.05	7,9	3182.55	8^-	D[&]		R=0.86 *20*.
1277.6 *5*	0.19 *5*	4259.7		2982.11	7^-			R=1.1 *4*.
[x]1286.0[@] *3*	0.7[@]							
1289.2 *5*	0.19 *5*	3947.10	(6^+)	2658.03	5^-	(D)[&]		R=0.98 *37*.
1290.6 *6*	0.05 *3*	4389.6	5,7	3098.95	6^-	D		R=0.7 *5*.

$^{146}_{64}Gd_{82}$-9

γ(^{146}Gd) (continued)

E_γ [†]	I_γ [†]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [‡]	α [c]	Comments
[x]1298.5[@] *3*	1.6[@]							E_γ: perhaps, γ do not belong to (α,2nγ) reaction.
1299.7 *2*	0.12 *3*	5164.38	11$^+$,9$^+$	3864.68	10$^+$	D[&]		R=0.71 *25*.
1300.5 *3*	0.66 *12*	4399.4	5$^-$,7$^-$	3098.95	6$^-$	D[&]		R=0.71 *18*.
1314.7 *6*	0.12 *4*	4608.3	8,10$^-$	3293.63	8$^-$	[a]		R=1.6 *8*.
1315.2 *2*	0.09 *1*	3287.25	3$^+$	1971.99	2$^+$	(D+Q)		R=0.96 *15*.
[x]1316.0[@] *3*	0.2[@]							A_2=+0.45 *4*.
1336.8 *2*	0.49 *8*	4318.91	6$^-$,7$^-$,8$^-$	2982.11	7$^-$			R=1.09 *25*, pol=−0.3 *4*.
1372.8 *6*	0.12 *3*	4354.95	5$^-$,6$^+$	2982.11	7$^-$	[&]		R=0.9 *3*.
1388.04 *9*	2.4 *3*	2967.49	4$^+$	1579.44	3$^-$	E1	7.56×10^{-4}	α(K)exp=0.00075 *20* α(K)=0.000541 *8*; α(L)=6.98×10^{-5} *10*; α(M)=1.497×10^{-5} *21* α(N)=3.44×10^{-6} *5*; α(O)=5.35×10^{-7} *8*; α(P)=3.65×10^{-8} *6*; α(IPF)=0.0001259 *18* A_2=−0.08 *7*, A_4=+0.04 *10*, R=0.88 *16*, pol=+0.1 *3*.
1391.8 *2*	0.20 *4*	4780.50		3388.70	3,(1)	D[&]		R=0.42 *12*.
1399 *1*	0.20 *6*	4580.3	7	3182.55	8$^-$	D[&]		R=0.8 *3*.
1408.8 *2*	0.08 *1*	3380.79	2$^+$	1971.99	2$^+$	M1	0.00209	α(K)=0.001740 *25*; α(L)=0.000233 *4*; α(M)=5.03×10^{-5} *7* α(N)=1.158×10^{-5} *17*; α(O)=1.81×10^{-6} *3*; α(P)=1.250×10^{-7} *18*; α(IPF)=5.14×10^{-5} *8* R=1.12 *20*, pol=+0.5 *4*, ΔJ=0.
1412.5[@] *3*	13[@]	5277.0		3864.68	10$^+$			
1412.5[@] *3*	1.3[@]	5320.4?		3907.9	(3$^-$)			
1416.7 *1*	0.30 *5*	3388.70	3,(1)	1971.99	2$^+$	D[&]		R=0.90 *21*.
1417.11 *10*	2.85 *18*	2996.52	4$^-$	1579.44	3$^-$	M1	0.00206	α(K)exp=0.0024 *2* α(K)=0.001717 *24*; α(L)=0.000230 *4*; α(M)=4.96×10^{-5} *7* α(N)=1.142×10^{-5} *16*; α(O)=1.783×10^{-6} *25*; α(P)=1.233×10^{-7} *18*; α(IPF)=5.41×10^{-5} *8* R=0.69 *6*, pol=−0.04 *18*.
1435.9 *2*	0.12 *2*	4729.54	(9$^+$,7$^+$)	3293.63	8$^-$	E1[&]	7.53×10^{-4}	α(K)=0.000511 *8*; α(L)=6.58×10^{-5} *10*; α(M)=1.411×10^{-5} *20* α(N)=3.24×10^{-6} *5*; α(O)=5.04×10^{-7} *7*; α(P)=3.45×10^{-8} *5*; α(IPF)=0.0001588 *23* R=0.87 *21*, pol=+0.3 *5*.
1444.6 *2*	0.10 *3*	3416.57	4$^+$	1971.99	2$^+$	E2	1.37×10^{-3}	α(K)=0.001122 *16*; α(L)=0.0001535 *22*; α(M)=3.32×10^{-5} *5* α(N)=7.61×10^{-6} *11*; α(O)=1.178×10^{-6} *17*; α(P)=7.79×10^{-8} *11*; α(IPF)=5.64×10^{-5} *8* R=1.2 *5*, pol=+0.3 *12*.
1451.77 *17*	0.60 *6*	3031.12	3$^+$	1579.44	3$^-$	D+Q		A_2=−0.19 *33*, A_4=+0.16 *46*, R=0.92 *13*.
1451.8 *3*	0.16 *4*	4880.1	10$^-$,8$^-$	3428.32	9$^-$	D[&]		R=0.62 *22*.
[x]1453.4[@] *3*	1.8[@]					D		A_2=−0.48 *18*, A_4=−0.20 *18*.
1460.2 *4*	0.23 *5*	4118.2		2658.03	5$^-$			

$^{146}_{64}$Gd$_{82}$-10

γ(^{146}Gd) (continued)

Eγ[†]	Iγ[†]	Ei(level)	J^π_i	E_f	J^π_f	Mult.[‡]	α[c]	Comments
1464.30 17	0.33 5	3436.27	4^+	1971.99	2^+	E2	1.35×10^{-3}	α(K)=0.001094 16; α(L)=0.0001494 21; α(M)=3.23×10^{-5} 5 α(N)=7.41×10^{-6} 11; α(O)=1.146×10^{-6} 16; α(P)=7.59×10^{-8} 11; α(IPF)=6.26×10^{-5} 9 R=1.4 3, pol=+0.5 5; conflicts with A_2=−0.13 5, A_4=−0.19 9.
1480 1	0.28 7	4580.3	7	3098.95	6^-	D[&]		R=0.69 23.
x1482.0[@] 3	0.6[@]							
1485.6[@] 3	7.6[@]	5350.3	(12)	3864.68	10^+	Q		A_2=+0.30 14, A_4=+0.05 10.
1508.5 3	0.22 5	4166.5	4,6	2658.03	5^-	D[&]		R=0.29 10.
1511 1	0.08 2	4122.6	$5^-,3^-$	2611.55	4^+	D[&]		R=0.8 3.
1512 1	0.12 3	3484.2	0^+	1971.99	2^+	(E2)[b]	1.29×10^{-3}	α(K)=0.001029 15; α(L)=0.0001401 20; α(M)=3.02×10^{-5} 5 α(N)=6.95×10^{-6} 10; α(O)=1.075×10^{-6} 16; α(P)=7.14×10^{-8} 10; α(IPF)=7.83×10^{-5} 12 Mult.: R=0.8 3; 0+→2^+ transition.
1521.6 4	0.28 5	4179.46	(6^-)	2658.03	5^-	D[&]		R=0.61 15.
1547 1	0.05 1	4729.54	$(9^+,7^+)$	3182.55	8^-			
1547.1 2	0.40 9	4529.22		2982.11	7^-			
1554 2	0.11 5	4847.6	9,7	3293.63	8^-	D[&]		R=0.27 17.
1579.40 7	100	1579.44	3^-	0.0	0^+	E3	0.00216	α(K)exp=0.0018 3; α(L)exp=0.00025 5 α(K)=0.001777 25; α(L)=0.000262 4; α(M)=5.71×10^{-5} 8 α(N)=1.310×10^{-5} 19; α(O)=2.01×10^{-6} 3; α(P)=1.278×10^{-7} 18; α(IPF)=4.64×10^{-5} 7 A_2=+0.55 2, A_4=+0.09 5; R=1.63 10, pol=+0.55 20.
x1584.5[@] 3	3.4[@]							
1591.1 3	0.10 3	3563.00	$4^+,2^+$	1971.99	2^+	[a]		R=1.4 7.
1604.7 6	0.09 3	4898.3	9,7	3293.63	8^-	D[&]		R=0.6 3.
1606.1 4	0.55 7	3185.87	2^+	1579.44	3^-	E1	7.76×10^{-4}	α(K)=0.000423 6; α(L)=5.43×10^{-5} 8; α(M)=1.164×10^{-5} 17 α(N)=2.68×10^{-6} 4; α(O)=4.16×10^{-7} 6; α(P)=2.86×10^{-8} 4; α(IPF)=0.000283 4 R=0.84 15, pol=−1.0 6.
1653.0 4	0.43 4	3232.4	2^+	1579.44	3^-	D[&]		Mult.: R=0.80 11.
1684.3 1	0.12 2	3656.28	3	1971.99	2^+	D[&]		R=0.75 18.
1688.2 3	0.12 3	4299.8	2^+	2611.55	4^+	[a]		R=1.4 5.
x1692.1[@] 3	1.1[@]							
1703 1	0.09 3	4802.0		3098.95	6^-			
1715 2	0.07 3	4326.6	3,5	2611.55	4^+	D[&]		R=0.6 4.
1715.7 3	0.04 1	4898.3	9,7	3182.55	8^-			
1718 1	0.19 4	4376.0	(4^+)	2658.03	5^-			
1733.7 3	0.13 3	3313.10	5^-	1579.44	3^-	(Q)		R=0.72 24, large uncertainty; mult=D contradicts to population of 3^- state from 5^- one.

$^{146}_{64}$Gd$_{82}$-11

γ(^{146}Gd) (continued)

E_γ [†]	I_γ [†]	E_i(level)	J^π_i	E_f	J^π_f	Mult. [‡]	α [c]	Comments
1741 *1*	0.08 *3*	4399.4	5⁻,7⁻	2658.03	5⁻			
1742 *2*	0.10 *3*	4354.95	5⁻,6⁺	2611.55	4⁺	[a]		R=1.1 *5*.
1758 *2*	0.03 *1*	3730.0		1971.99	2⁺			
1760 *1*	0.06 *2*	4942.6		3182.55	8⁻			
1772 *1*	0.09 *3*	3744.2	(2⁺,3⁻)	1971.99	2⁺			R=1.1 *5*.
1784.4 *1*	0.47 *6*	3363.87	4	1579.44	3⁻	D [&]		R=0.58 *11*.
1789.5 *6*	0.19 *4*	3761.5	(4⁺)	1971.99	2⁺	(E2) [b]	1.07×10^{-3}	α(K)=0.000751 *11*; α(L)=0.0001006 *14*; α(M)=2.17×10^{-5} *3* α(N)=4.98×10^{-6} *7*; α(O)=7.73×10^{-7} *11*; α(P)=5.21×10^{-8} *8*; α(IPF)=0.000190 *3* R=1.3 *4*.
1800 *1*	0.06 *3*	4782.1	8,6	2982.11	7⁻	D [&]		R=0.4 *3*.
1801.0 *5*	0.29 *7*	3380.79	2⁺	1579.44	3⁻	D [&]		R=0.9 *3*.
1826 *1*	0.24 *6*	4484.2	(4⁺)	2658.03	5⁻	D [&]		R=0.64 *23*.
1837.2 *2*	0.74 *6*	3416.57	4⁺	1579.44	3⁻	(E1) [b]	8.50×10^{-4}	α(K)=0.000339 *5*; α(L)=4.34×10^{-5} *6*; α(M)=9.29×10^{-6} *13* α(N)=2.14×10^{-6} *3*; α(O)=3.32×10^{-7} *5*; α(P)=2.29×10^{-8} *4*; α(IPF)=0.000456 *7* A_2=−0.20 *14*, A_4=+0.02 *20*, R=0.63 *7*.
1843.73 *19*	0.62 *6*	3423.19	3⁻	1579.44	3⁻	D+Q		A_2=−0.02 *16*, A_4=+0.27 *22*, R=0.75 *10*.
1857.0 *3*	0.20 *4*	3436.27	4⁺	1579.44	3⁻	(E1) [&b]	8.58×10^{-4}	α(K)=0.000333 *5*; α(L)=4.26×10^{-5} *6*; α(M)=9.13×10^{-6} *13* α(N)=2.10×10^{-6} *3*; α(O)=3.27×10^{-7} *5*; α(P)=2.25×10^{-8} *4*; α(IPF)=0.000470 *7* R=0.32 *9*.
[x]1871.5 [@] *3*	1.9 [@]							
1877.0 *2*	0.43 *13*	3456.46	4⁺	1579.44	3⁻	[b]		A_2=+0.80 *40*, A_4=−0.36 *40*, R=1.8 *8*. Mult.: E1, M1 or E2 in 2010CaZZ.
1881.4 *2*	0.14 *3*	3853.57	(3⁻)	1971.99	2⁺	[a]		R=1.3 *4*.
1881.7 *3*	0.28 *7*	3461.2	3⁻,1⁻,5⁻	1579.44	3⁻	Q		A_2=+0.40 *13*, A_4=−0.33 *18*, R=1.5 *6*.
1884.6 *2*	0.90 *22*	3464.03	5⁻	1579.44	3⁻	[a]		R=1.3 *3*, A_2=−0.13 *23*, A_4=−0.08 *33*.
1899 *1*	0.06 *3*	3478.5		1579.44	3⁻			
1902.4 *6*	0.28 *7*	3481.9	(3⁺)	1579.44	3⁻	E1	8.76×10^{-4}	α(K)=0.000321 *5*; α(L)=4.10×10^{-5} *6*; α(M)=8.77×10^{-6} *13* α(N)=2.02×10^{-6} *3*; α(O)=3.14×10^{-7} *5*; α(P)=2.17×10^{-8} *3*; α(IPF)=0.000504 *7* R=0.8 *3*, pol=−0.8 *10*.
1905.8 *6*	0.13 *6*	3484.74	6⁺	1579.44	3⁻	E3	1.56×10^{-3}	α(K)=0.001207 *17*; α(L)=0.0001714 *24*; α(M)=3.72×10^{-5} *6* α(N)=8.55×10^{-6} *12*; α(O)=1.320×10^{-6} *19*; α(P)=8.63×10^{-8} *12*; α(IPF)=0.0001326 *19* R=1.2 *9*, pol=+0.8 *10*.
1909 *1*	0.05 *2*	4520.6		2611.55	4⁺			
1921 *2*	0.06 *3*	4532.6	3,5	2611.55	4⁺	D [&]		R=0.8 *5*.
1972.00 *10*	94 *5*	1971.99	2⁺	0.0	0⁺	E2 [b]	1.01×10^{-3}	α(K)exp=0.0007 *2*

From ENSDF

γ(^{146}Gd) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[‡]	α[c]	Comments
								α(K)=0.000629 *9*; α(L)=8.35×10^{-5} *12*; α(M)=1.80×10^{-5} *3* α(N)=4.13×10^{-6} *6*; α(O)=6.42×10^{-7} *9*; α(P)=4.36×10^{-8} *7*; α(IPF)=0.000274 *4* A_2=+0.24 *3*, A_4=−0.03 *6*, R=1.25 *12*.
[x]1983.0[@] *3*	1.4[@]							
1983.1 *3*	0.37 *11*	3563.00	4$^+$,2$^+$	1579.44	3$^-$	D[&]		R=0.8 *3*.
2006 *1*	0.75 *12*	3585.5	4,2	1579.44	3$^-$	D[&]		R=0.59 *13*.
2034.7 *5*	0.03 *2*	4006.7	(4$^+$)	1971.99	2$^+$			
2076 *2*	0.05 *2*	3656.28	3	1579.44	3$^-$			
2107.2 *8*	0.48 *6*	3686.7	5$^-$	1579.44	3$^-$	E2[b]	9.89×10^{-4}	α(K)=0.000557 *8*; α(L)=7.37×10^{-5} *11*; α(M)=1.585×10^{-5} *23* α(N)=3.64×10^{-6} *6*; α(O)=5.67×10^{-7} *8*; α(P)=3.86×10^{-8} *6*; α(IPF)=0.000338 *5* R=1.21 *21*.
2165.0 *3*		2164.72	0$^+$	0.0	0$^+$	E0		I(ce)=6 *1* (1986Ya06). $I_{(\gamma+ce)}$: I(2165,E0)/Iγ(193,E2)=4.5 *9* (1989KlZY), 4.4 *22* (1986Ya06).
2165 *1*	0.11 *3*	3744.2	(2$^+$,3$^-$)	1579.44	3$^-$			
2210 *3*	0.09 *5*	3789	(2$^-$,3$^-$,4$^-$)	1579.44	3$^-$	(M1)	1.18×10^{-3}	α(K)=0.000627 *9*; α(L)=8.29×10^{-5} *12*; α(M)=1.79×10^{-5} *3* α(N)=4.11×10^{-6} *6*; α(O)=6.42×10^{-7} *10*; α(P)=4.47×10^{-8} *7*; α(IPF)=0.000445 *7* Mult.: possible M1 (2010CaZZ).
2274 *1*	0.24 *5*	3853.57	(3$^-$)	1579.44	3$^-$	[a]		R=1.6 *5*.
2329 *1*	0.08 *2*	3907.9	(3$^-$)	1579.44	3$^-$			
2394 *1*	0.16 *5*	3973.5	(3$^-$)	1579.44	3$^-$			R=1.0 *4*.
2408 *1*	0.30 *7*	3987.5		1579.44	3$^-$			R=1.1 *4*.
2427 *1*	0.02 *1*	4006.7	(4$^+$)	1579.44	3$^-$			
2534 *1*	0.12 *4*	4113.5		1579.44	3$^-$			R=0.9 *4*.
2573 *1*	0.20 *5*	4152.5	2,4	1579.44	3$^-$	D[&]		R=0.45 *16*.
2651 *2*	0.13 *6*	4230.5	5$^-$	1579.44	3$^-$			
2707 *2*	0.11 *6*	4286.5		1579.44	3$^-$			
2762 *2*	0.07 *4*	4341.5	(4$^-$)	1579.44	3$^-$			Mult.: possible M1 (2010CaZZ).
2793 *2*	0.10 *4*	4372.5	(4$^+$)	1579.44	3$^-$			
2906 *3*	0.05 *4*	4484.2	(4$^+$)	1579.44	3$^-$			
2986.0 *7*	1.03 *20*	2985.9	2$^+$	0.0	0$^+$	E2[b]	1.09×10^{-3}	α(K)=0.000300 *5*; α(L)=3.90×10^{-5} *6*; α(M)=8.36×10^{-6} *12* α(N)=1.92×10^{-6} *3*; α(O)=3.00×10^{-7} *5*; α(P)=2.08×10^{-8} *3*; α(IPF)=0.000743 *11* Mult.: R=1.5 *4*; 2+→0$^+$ transition.
3020 *2*		3019.80	0$^+$	0.0	0$^+$	E0		E_γ: γ unobserved, ce measured (1987Ya13).
3142 *3*	0.04 *2*	4721	4$^-$	1579.44	3$^-$			
3356.7 *5*	1.74 *20*	3356.7	2$^+$	0.0	0$^+$	E2	1.18×10^{-3}	α(K)=0.000245 *4*; α(L)=3.17×10^{-5} *5*; α(M)=6.79×10^{-6} *10* α(N)=1.562×10^{-6} *22*; α(O)=2.44×10^{-7} *4*; α(P)=1.694×10^{-8} *24*; α(IPF)=0.000898 *13* Mult.: 2+→0$^+$ transition.
3381.5 *8*	0.23 *8*	3380.79	2$^+$	0.0	0$^+$	E2	1.19×10^{-3}	α(K)=0.000242 *4*; α(L)=3.13×10^{-5} *5*; α(M)=6.71×10^{-6} *10*

From ENSDF

γ(^{146}Gd) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[‡]	α[c]	Comments
								α(N)=1.542×10^{-6} *22*; α(O)=2.41×10^{-7} *4*; α(P)=1.673×10^{-8} *24*; α(IPF)=0.000908 *13*
3485 *2*		3484.2	0$^+$	0.0	0$^+$	E0		K/L=10 *5* (1987Ya13) E_γ: γ unobserved, ce measured (1987Ya13).
3547.5 *8*	0.25 *5*	3547.5	2$^+$	0.0	0$^+$	E2	1.23×10^{-3}	α(K)=0.000223 *4*; α(L)=2.87×10^{-5} *4*; α(M)=6.16×10^{-6} *9* α(N)=1.418×10^{-6} *20*; α(O)=2.21×10^{-7} *3*; α(P)=1.540×10^{-8} *22*; α(IPF)=0.000974 *14* R=1.1 *3*. Mult.: 2+→0$^+$ transition.
3639 *2*		3640.4	0$^+$	0.0	0$^+$	E0		K/L=7.2 *6*; L/M=2.6 *5* (1987Ya13) E_γ: γ unobserved, ce measured (1987Ya13).

[†] From 2010CaZZ, except otherwise noted.
[‡] From α(exp), A_2, A_4 (1986Ya06,1972Ko42), anisotropy and polarization of γ rays (2010CaZZ); α(exp) from 1986Ya06 except otherwise noted.
[#] From ce measurements (1979Kl04).
[@] Observed at E(α)=32 MeV only by 1972Ko42; Iγ's (ΔIγ=10-20%) are normalized to Iγ(1579γ)=100 by evaluators; A_2, A_4 values are from 1972Ko42.
[&] A_2<0, most likely ΔJ=1 (2010CaZZ).
[a] A_2>0, most likely ΔJ=2 or ΔJ=0 (2010CaZZ).
[b] γ-ray exhibits a Doppler shift: most likely electric multipole emission (2010CaZZ).
[c] Additional information 1.
[d] If No value given it was assumed δ=1.00 for E2/M1.
[e] Multiply placed.
[f] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

$^{146}_{64}$Gd$_{82}$-14

$^{144}Sm(\alpha,2n\gamma)$ 1986Ya06,1972Ko42,2010CaZZ

Level Scheme

Intensities: Relative I_γ

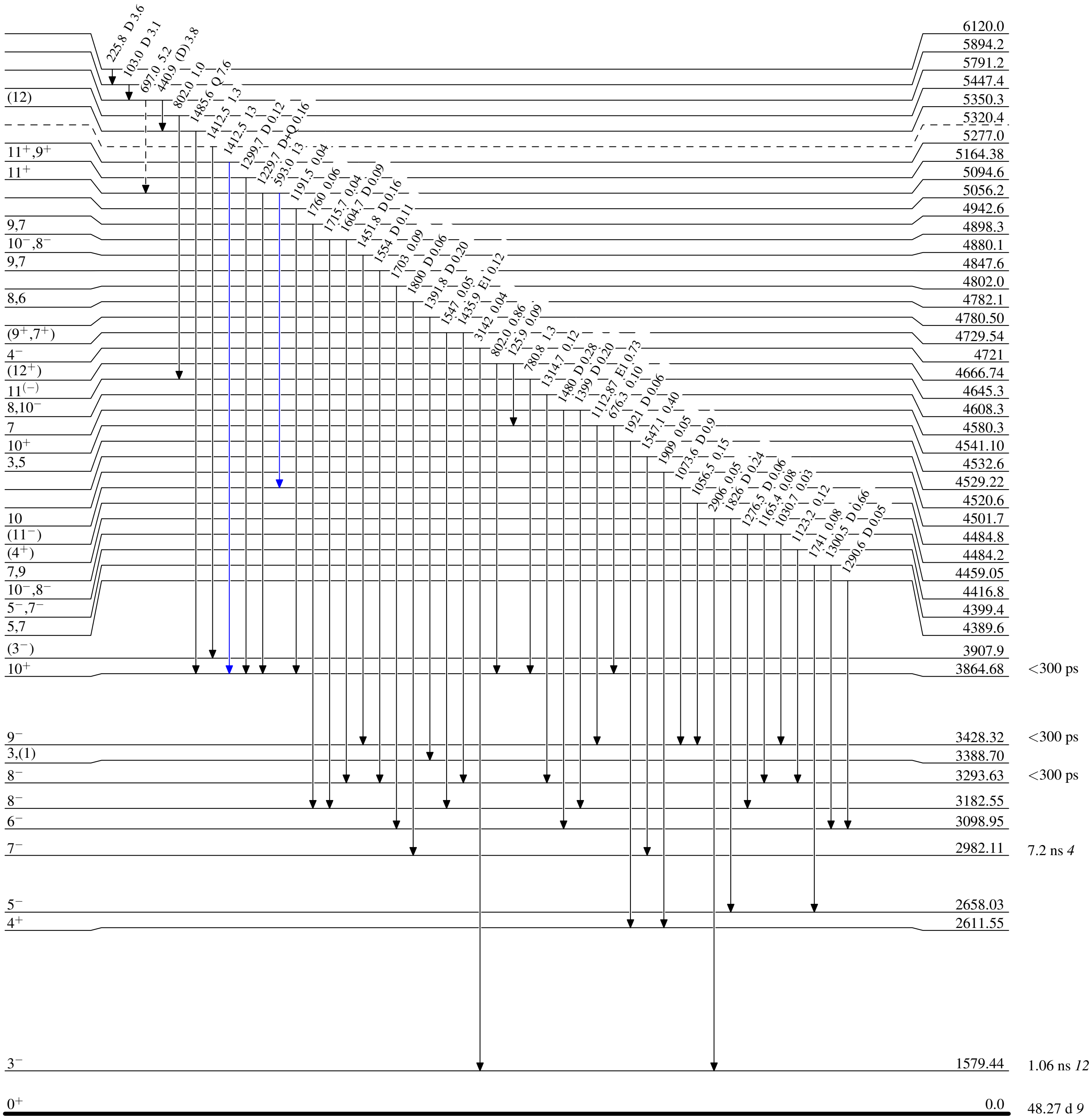
Legend

$I_\gamma < 2\% \times I_\gamma^{max}$

$I_\gamma < 10\% \times I_\gamma^{max}$

$I_\gamma > 10\% \times I_\gamma^{max}$

γ Decay (Uncertain)



$^{146}_{64}Gd_{82}$

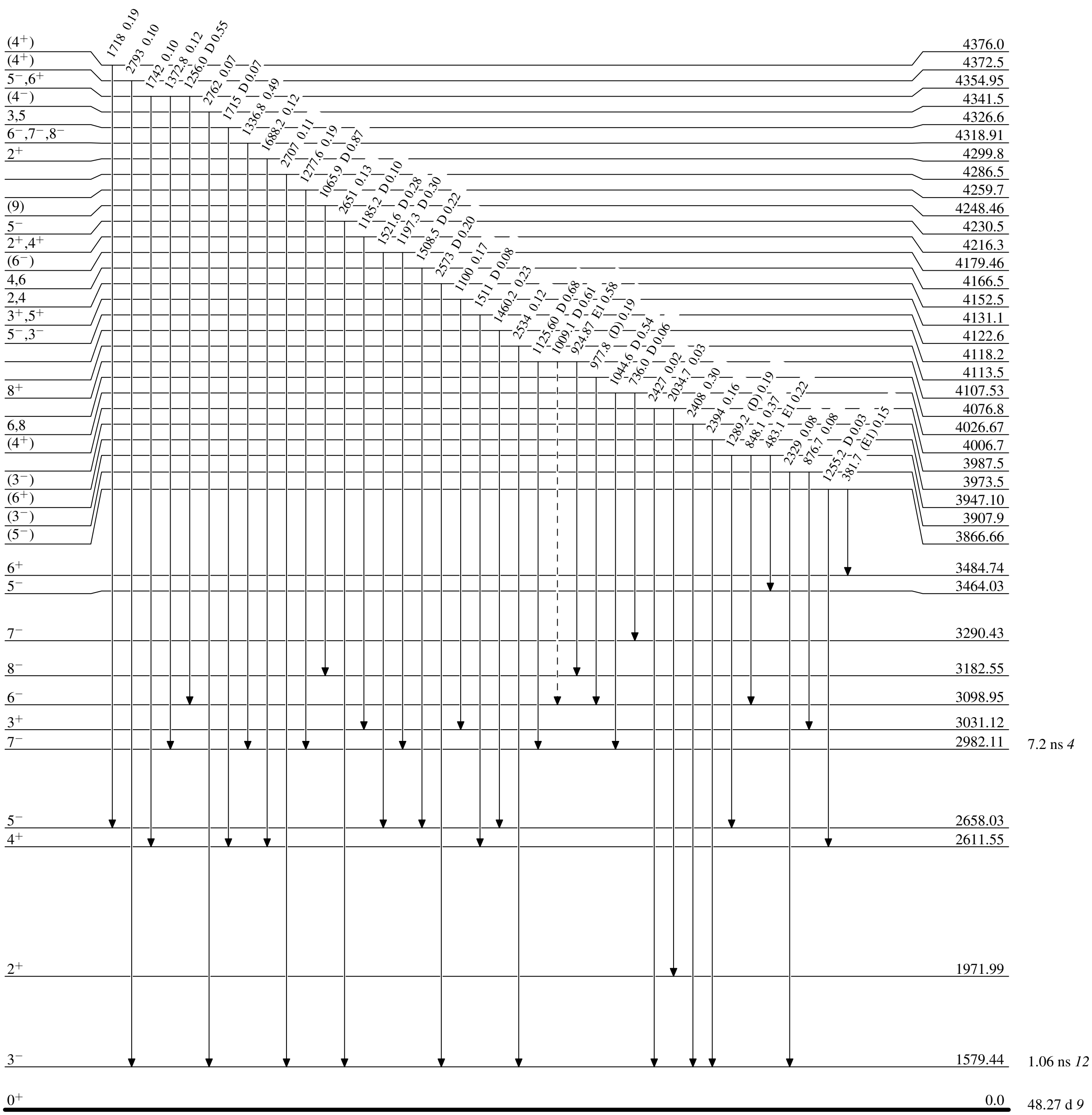
$^{144}Sm(\alpha,2n\gamma)$ 1986Ya06,1972Ko42,2010CaZZ

Level Scheme (continued)

Intensities: Relative I_γ

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)



$^{146}_{64}Gd_{82}$

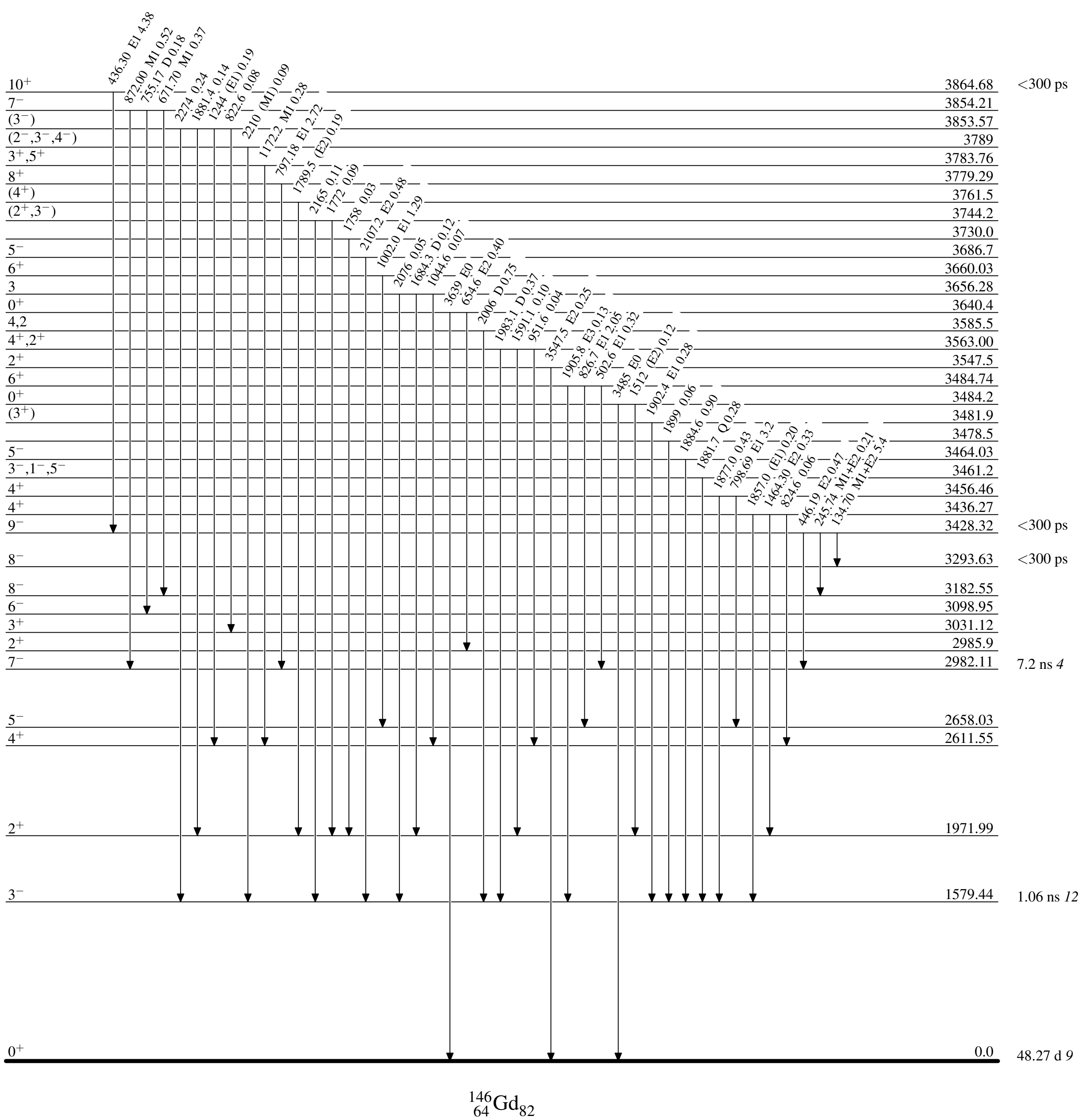
^{144}Sm(α,2nγ) 1986Ya06,1972Ko42,2010CaZZ

Legend

Level Scheme (continued)

Intensities: Relative I_γ

$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$



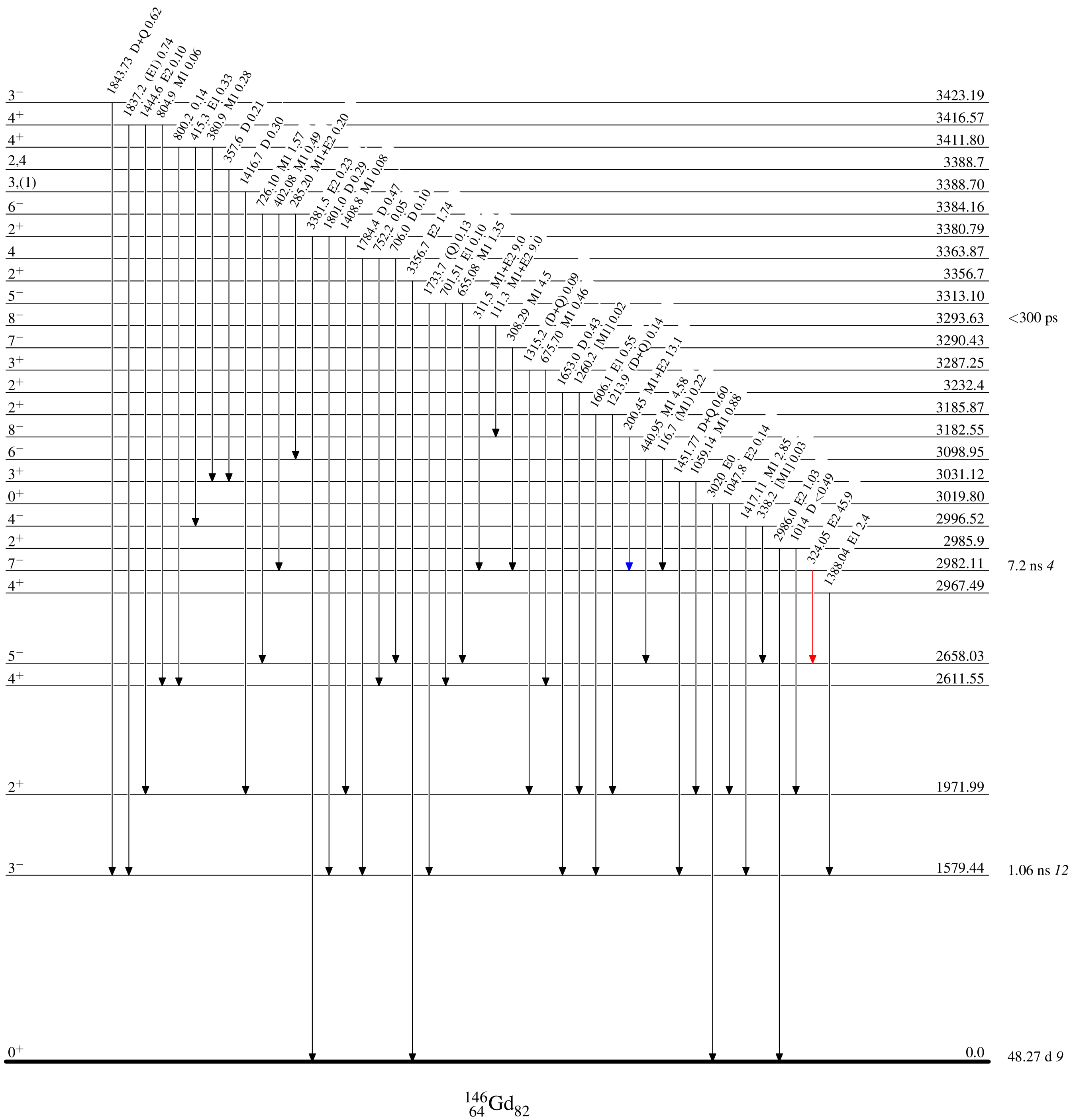
^{144}Sm(α,2nγ) 1986Ya06,1972Ko42,2010CaZZ

Level Scheme (continued)

Intensities: Relative I_γ

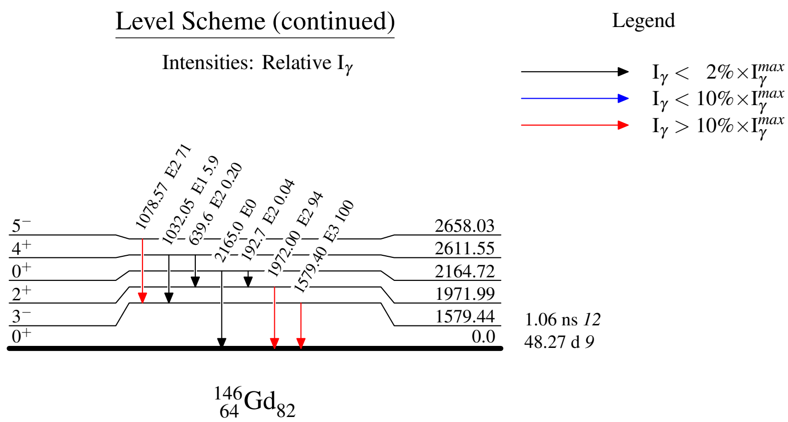
Legend

$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$



$^{146}_{64}Gd_{82}$

^{144}Sm(α,2nγ) 1986Ya06,1972Ko42,2010CaZZ



^{144}Sm(α,2nγ) 1986Ya06,1972Ko42,2010CaZZ