Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	N. Nica and B. Singh	NDS 181, 1 (2022)	9-Mar-2022

Q(β^-)=2703 *16*; S(n)=6840 *40*; S(p)=7107 *22*; Q(α)=302 *17* 2021Wa16
S(2n)=11961 *17*, S(2p)=17187 *20* (2021Wa16).
All data for ^{147}Pr reported in 2000Hw03 and 2001Ha14 are omitted because in a later reference, 2009Lu04, published by the same group, they explained that the whole dataset described in 2000Hw03 and 2001Ha14 as pertaining to ^{147}Pr was reassigned to ^{144}La (see dataset for ^{144}La from 2009Lu04 for reassignment of these cascades).

^{147}Pr Levels

Cross Reference (XREF) Flags

A	^{147}Ce β^- decay
B	^{252}Cf SF decay
C	^{148}Nd(t,α)

E(level)†	J^π‡#	$T_{1/2}$	XREF	Comments
0.0	(3/2$^+$)	13.44 min *10*	AB	%β^-=100 J^π: M1 γ from (5/2$^+$), 93 level as assigned by 1993Ma39 (^{147}Ce β^- decay) and 2015Wa28 (^{252}Cf SF decay). Based on syst one has J^π(g.s.)=(5/2$^+$) for ^{145}La (1993Pe07), ^{149}Pr (2004Si16) and J^π=7/2$^+$ for ^{145}Pr (1993Pe07), ^{149}Pm (2004Si16), with 7/2$^+$ most likely excluded by log *ft*=6.9 to 3/2$^-$, 315 level of ^{147}Nd β^- decay daughter. (5/2$^+$) is also in agreement with shell-model calculations: Nilsson model (π5/2[413]), and particle-plus-triaxial rotor model (1993Ma39, β_2≈0.17, γ=0°, Fig. 5,6 show 5/2$^+$ as calculated g.s.). As (3/2$^+$) is sustained by stronger arguments (based on measurements) as compared with (5/2$^+$) that results from weaker arguments (syst and calculations), (3/2$^+$) is adopted by the current evaluation. However as neither of (3/2$^+$) and (5/2$^+$) seems to be excluded by ^{147}Pr β^- decay to ^{147}Nd, (5/2$^+$) should not be excluded without more elaborate future measurements. As a matter of fact (5/2$^+$) was proposed by 1975Pi03 and 1981Ya06, and adopted by 1978Ha22 and 2009Ni02 evaluations, while (3/2$^+$) was preferred by 1992De38 evalution. One can also note that the discovery of the rotational bands by 2015Wa28 in this nucleus rather favors (3/2$^+$) as 2015Wa28 suggest, from which one can get proper J^π's to the intermediary levels leading to (7/2$^-$), 362 and (11/2$^-$), 385 where the bandhead of the first band is, which gives the best match of the low spin and high spin structures. $T_{1/2}$: weighted average of 13.6 min *5* (1975Do15), 13.3 min *4* (1981Ya06), and 13.44 min *10* (2015Ru09, weighted average of 13.34 min *6* from 78γ, 13.51 min *7* from 128γ, and 13.98 min *20* from 1261γ).
2.67 *11*	(5/2$^+$)		AB	J^π: E2 γ from (9/2$^+$), 247 level.
27.77 *11*	(7/2$^+$)		ABC	J^π: L=4 in ^{148}Nd(t,α) dataset with (7/2$^+$) assigned by 1990Zy01, and confirmed by 1993Ma39 (^{147}Ce β^- decay) and 2015Wa28 (^{252}Cf SF decay). configuration: 3/2$^+$[404] from ^{148}Nd(t,α) (1990Zy01).
93.29 *9*	(5/2$^+$)	12 ns	ABC	XREF: C(88). J^π: L=2 in ^{148}Nd(t,α) dataset with (5/2$^+$) assigned by 1990Zy01, and confirmed by 1993Ma39 (^{147}Ce β^- decay) and 2015Wa28 (^{252}Cf SF decay). $T_{1/2}$: from ^{147}Ce β^- decay (1981ScZM). configuration: 1/2$^+$[420] or 3/2$^+$[411] from ^{148}Nd(t,α) (1990Zy01).
154 *23*			C	
246.52 *11*	(9/2$^+$)		ABC	XREF: C(253). J^π: M1+E2 γ to (7/2$^+$), 28 level and E1 γ from (11/2$^-$), 385 level.
291.82 *9*	(5/2$^+$)		A	J^π: (3/2$^+$,5/2$^+$) from M1+E2 γ to (3/2$^+$) g.s. and M1 γ to (5/2$^+$), 2.7 level; (3/2$^+$) less likely from γ from (7/2$^-$), 362 level.

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Adopted Levels, Gammas (continued)

^{147}Pr Levels (continued)

E(level)[†]	J^{π}[‡#]	XREF	Comments
362.03 *10*	(7/2$^-$)	AB	J^π: (5/2$^-$,7/2$^-$) from E1 γ to (5/2$^+$), 93 level; (5/2$^-$) less likely from γ from (11/2$^-$), 385 level.
384.77[@] *15*	(11/2$^-$)	ABC	XREF: C(380). J^π: L=5 in ^{148}Nd(t,α) dataset with (11/2$^-$) assigned by 1990Zy01, and confirmed by 2015Wa28 (^{252}Cf SF decay). $T_{1/2}$: <20 ns from $\gamma\gamma$(t) (2015Wa28). configuration: 1/2$^-$[550] from ^{148}Nd(t,α) (1990Zy01).
452.32 *12*	(3/2$^-$,5/2$^-$)	A c	XREF: c(461). J^π: (E1) γ to (5/2$^+$), 93 level and (E1) γ to (3/2$^+$), g.s.
467.48 *10*	(3/2$^-$,5/2$^-$)	A c	XREF: c(461). J^π: (3/2$^-$,5/2$^-$) from E1 γ to (5/2$^+$), 93 level and (E1) γ to (3/2$^+$), g.s.
470.69 *15*	(9/2$^+$)	A	J^π: based on actual data the level is not clearly fed by β^- decay from (5/2$^-$) g.s. of the ^{147}Ce parent that implies that J^π is likely to be not 3/2,5/2,7/2; (E2) γ to (5/2$^+$) and other γ's to (5/2$^+$), (7/2$^+$), and (7/2$^-$) levels determine (9/2$^+$) as most likely possibility.
545.91 *14*	(9/2$^+$)	A C	XREF: C(556). J^π: (9/2$^+$) from M1,E2 γ to (5/2$^+$) and γ from (11/2$^-$), 385, which is marginally compatible with log *ft*=7.4 from (5/2$^-$) g.s. β^- decay of ^{147}Ce parent.
608.01 *14*	(7/2$^-$)	A	J^π: (5/2$^-$,7/2$^-$) from (E1) γ to (7/2$^+$), 28 level and (E1) γ to (5/2$^+$), 28 level; (5/2$^-$) less likely from γ to (9/2$^+$).
638.00 *20*	(3/2,5/2,7/2$^-$)	A C	XREF: C(653). J^π: γ's to (3/2$^-$,5/2$^-$), 452 and (5/2$^+$), 93 levels respectively.
641.4[@] *6*	(15/2$^-$)[a]	B	
701.32 *14*	(5/2$^-$)	A	J^π: (1/2$^-$,3/2$^-$,5/2$^-$) from (E1) γ to (3/2$^+$) g.s.; (5/2$^-$) provided γ to (9/2$^+$), 247 is M2.
716 *10*	(5/2)$^+$	C	J^π: L=2 in ^{148}Nd(t,α) dataset with (5/2)$^+$ assigned by 1990Zy01. configuration: 5/2$^+$[413] or 5/2$^+$[402] from ^{148}Nd(t,α) (1990Zy01).
748.88 *15*	(5/2$^+$,7/2)	A	J^π: (5/2$^+$,7/2,9/2$^+$) from γ's to (5/2$^+$), 93 and (9/2$^+$), 247 levels respectively; and (3/2,5/2,7/2) from log *ft*=6.8 from (5/2$^-$) g.s. β^- decay of ^{147}Ce parent.
783.6 *4*		A	
795 *11*	(7/2)$^+$	C	J^π: L=4 in ^{148}Nd(t,α) dataset with (7/2)$^+$ assigned by 1990Zy01. configuration: 5/2$^+$[413] from ^{148}Nd(t,α) (1990Zy01).
802.84 *13*	(5/2$^+$)	A	J^π: M1+E2 γ to (3/2$^+$) g.s. and γ to (7/2$^-$), 362 levels.
931.57 *17*	(3/2,5/2,7/2$^+$)	A	J^π: γ's to (3/2$^+$) g.s., (5/2$^+$) 93, level, and (5/2$^-$), 467 level.
951.63 *14*	(5/2$^+$,7/2$^+$)	A	J^π: γ's to (3/2$^+$) g.s. and (9/2$^+$), 247 level.
961.06 *17*	(5/2$^+$,7/2)	A	J^π: (5/2$^+$,7/2,9/2$^-$) from γ's to (9/2$^+$), 247 and (5/2$^-$), 467 levels respectively; and (3/2,5/2,7/2) from log *ft*=6.9 from (5/2$^-$) g.s. β^- decay of ^{147}Ce parent.
978.07 *17*	(7/2$^-$)	A	J^π: (7/2$^-$,9/2$^-$) from γ to (5/2$^-$), 467 and γ to (11/2$^-$), 385; (9/2$^-$) discarded by log *ft*=7.7 from (5/2$^-$) g.s. β^- decay of ^{147}Ce parent.
1045.94 *13*	(3/2$^-$,5/2)	A	J^π: γ's to (3/2$^+$) g.s., (3/2$^-$), 452 and (7/2$^-$), 362 levels, respectively.
1058.90 *24*	(7/2$^-$,9/2$^+$)	A	J^π: γ's to (5/2$^+$), 2.7 and (11/2$^-$), 385 levels respectively.
1065.3[@] *8*	(19/2$^-$)[a]	B	
1068.05 *16*	(7/2$^+$)	A	J^π: γ's to (3/2$^+$) g.s. and (11/2$^-$), 385 provided the latter is M2.
1159.58 *24*	(3/2,5/2,7/2$^-$)	A	J^π: γ's to (3/2$^-$,5/2$^-$), 453 and (5/2$^+$), 2.7 levels respectively.
1170.21 *16*	(7/2$^+$)	A	J^π: γ's to (3/2$^+$) g.s. and (11/2$^-$), 385 provided the latter is M2.
1172.88 *20*	(3/2$^-$,5/2,7/2$^-$)	A	J^π: γ's to (3/2$^-$), 452 and (7/2$^-$), 362 levels respectively.
1194.43 *14*	(5/2$^+$,7/2$^+$)	A	J^π: γ's to (3/2$^+$) g.s. and (9/2$^+$), 546 levels respectively.
1267.30 *18*	(5/2$^+$,7/2)	A	J^π: γ's to (5/2$^+$), 2.7, (5/2$^-$), 467, and (9/2$^+$), 471 levels, respectively.
1285.79 *20*	(3/2$^-$,5/2,7/2$^-$)	A	J^π: γ's to (3/2$^-$), 452 and (7/2$^-$), 362 levels respectively.
1601.4[@] *9*	(23/2$^-$)[a]	B	
1724.93 *14*	(5/2$^+$,7/2$^+$)	A	J^π: γ's to (3/2$^+$) g.s. and (9/2$^+$), 247 levels respectively.
1845.92 *15*	(5/2,7/2$^-$)	A	J^π: γ's to (3/2$^-$), 452, (7/2$^+$), 1170, and (7/2$^-$), 978 levels, respectively.
1856.34 *20*	(3/2$^-$,5/2,7/2)	A	J^π: γ's to (5/2$^-$), 467, (5/2$^+$), 292, and (7/2$^-$), 362, respectively.
1864.94 *15*	(3/2$^-$,5/2$^-$,7/2$^-$)	A	J^π: (3/2$^-$,5/2,7/2$^-$) from γ's to (3/2$^-$), 453 and (7/2$^-$), 608 respectively; (3/2$^-$,5/2$^-$,7/2$^-$) from log *ft*=5.8 from (5/2$^-$) g.s. of ^{147}Ce β^- decay parent.
1943.85 *13*	(7/2$^-$)	A	J^π: (5/2$^+$,7/2$^-$) from γ's to (3/2$^-$), 608 and (9/2$^+$), 247 levels respectively; (7/2$^-$) from

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Adopted Levels, Gammas (continued)

^{147}Pr Levels (continued)

E(level)[†]	J^{π}[‡#]	XREF	Comments
			log *ft*=5.4 from (5/2⁻) g.s. of ^{147}Ce β^- decay parent.
2060.58 *18*	(5/2,7/2)	A	J^{π}: (5/2,7/2,9/2⁺) from γ's to (7/2⁻), 608 and (7/2⁺), 28, and (5/2⁺), 292 levels, respectively; (5/2,7/2) from log *ft*=5.90 *7* from (5/2⁻) g.s. β^- decay of ^{147}Ce parent (or (5/2⁻,7/2⁻) for log *ft*<5.90).
2135.32 *18*	(7/2⁻)	A	J^{π}: (5/2⁺,7/2,9/2⁺) from γ's to (5/2⁺), 282 and (9/2⁺), 546 levels, respectively; (7/2⁻) from log *ft*=5.8 from (5/2⁻) g.s. β^- decay of ^{147}Ce parent.
2182.85 *16*	(7/2⁻)	A	J^{π}: (7/2⁻,9/2⁺) from γ's to (5/2⁺), 93 and (11/2⁻), 385 levels 292 respectively; (7/2⁻) from log *ft*=5.6 from (5/2⁻) g.s. β^- decay of ^{147}Ce parent.
2209.3[@] *11*	(27/2⁻)[a]	B	
2249.64 *18*	(7/2⁻)	A	J^{π}: (5/2⁺,7/2) from γ's to (5/2⁺), 2.7, (5/2⁻), 701, and (9/2⁺), 471 levels, respectively; (7/2⁻) from log *ft*=5.8 from (5/2⁻) g.s. β^- decay of ^{147}Ce parent.
2869.8[@] *12*	(31/2⁻)[a]	B	
x[&]		B	Additional information 1.
253.5+x[&] *5*		B	
628.1+x[&] *7*		B	
1122.9+x[&] *9*		B	
1665.5+x[&] *10*		B	

† From least-squares fit to Eγ's; as Eγ's were reported with no uncertainties, ΔEγ=0.30 keV was assumed for least-squares fitting.

‡ Important for adopted J^{π} values are the assignments in ^{148}Nd(t,α) based on L values determined by 1990Zy01 from $\sigma(\theta)$ measurements. The J^{π} values adopted here are those of 1990Zy01 but reinterpreted by 1993Ma39 who translated the levels of 1990Zy01 up such a way that g.s. of 1990Zy01 corresponds to second excited state of 1993Ma39, first excited state of 1990Zy01 corresponds to third excited state of 1993Ma39, and so on. Therefore although the L values are strong arguments in assigning J^{π} values, they get somehow weakened by the properness of the extra operation of rematching their energies which is rather a working hypothesis than an unambiguous assignment (beyond the large ΔE values of the states measured by 1990Zy01). For this reason both J and π valeus adopted here from 1990Zy01 are considered tentative.

\# log *ft* values were used for some J^{π} assignments though they might be not very reliable (see ^{147}Ce β^- decay dataset).

@ Band(A): Band based on (11/2⁻).

& Band(B): γ cascade.

a Postulated by 2015Wa28 (^{252}Cf SF dataset) based on assigned (11/2⁻), 385 band structure.

$\gamma(^{147}Pr)$

See ^{147}Ce β^- decay for unplaced γ's.

E_i(level)	J^π_i	E_γ[#]	I_γ[#]	E_f	J^π_f	Mult.[@]	δ[‡]	α[†]	Comments
2.67	$(5/2^+)$	(2.7 *10*)		0.0	$(3/2^+)$				
27.77	$(7/2^+)$	25.3	100	2.67	$(5/2^+)$				
93.29	$(5/2^+)$	65.21	14	27.77	$(7/2^+)$				
		90.44	21	2.67	$(5/2^+)$				
		93.17	100	0.0	$(3/2^+)$	M1		1.586	B(M1)(W.u.)=7.73×10^{-4} α(K)=1.350 *19*; α(L)=0.186 *3*; α(M)=0.0393 *6* α(N)=0.00879 *13*; α(O)=0.001414 *20*; α(P)=0.0001037 *15*
246.52	$(9/2^+)$	218.751[a] *10*	100	27.77	$(7/2^+)$	M1+E2	0.57	0.1446	α(K)=0.1203 *17*; α(L)=0.0192 *3*; α(M)=0.00410 *6* α(N)=0.000910 *13*; α(O)=0.0001423 *20*; α(P)=8.80×10^{-6} *13* E_γ: 218.384 (1993Ma39). Mult.: from α(K)exp=0.175 *4* in ^{147}Ce β^- decay (1993Ma39).
		243.693	34	2.67	$(5/2^+)$	E2		0.0985	α(K)=0.0764 *11*; α(L)=0.01731 *25*; α(M)=0.00379 *6* α(N)=0.000829 *12*; α(O)=0.0001230 *18*; α(P)=4.81×10^{-6} *7* Mult.: from α(K)exp=0.077 *4* in ^{147}Ce β^- decay (1993Ma39).
291.82	$(5/2^+)$	198.534[a] *12*	100	93.29	$(5/2^+)$	M1		0.190	α(K)=0.1621 *23*; α(L)=0.0221 *3*; α(M)=0.00465 *7* α(N)=0.001040 *15*; α(O)=0.0001675 *24*; α(P)=1.239×10^{-5} *18* E_γ: 198.214 in ^{147}Ce β^- decay (1993Ma39). Mult.: from α(K)exp=0.175 *5* in ^{147}Ce β^- decay (1993Ma39).
		263.70	4	27.77	$(7/2^+)$				
		289.345	64	2.67	$(5/2^+)$	M1		0.0690	α(K)=0.0590 *9*; α(L)=0.00795 *12*; α(M)=0.001672 *24* α(N)=0.000374 *6*; α(O)=6.03×10^{-5} *9*; α(P)=4.49×10^{-6} *7* Mult.: from α(K)exp=0.074 *2* in ^{147}Ce β^- decay (1993Ma39).
		292.036	21	0.0	$(3/2^+)$	M1+E2		0.061 *7*	α(K)=0.051 *7*; α(L)=0.0083 *6*; α(M)=0.00178 *15* α(N)=0.00039 *3*; α(O)=6.1×10^{-5} *3*; α(P)=3.6×10^{-6} *8* Mult.: from α(K)exp=0.0522 *4* in ^{147}Ce β^- decay (1993Ma39).
362.03	$(7/2^-)$	69.89	2	291.82	$(5/2^+)$				
		115.5	0.36	246.52	$(9/2^+)$				
		268.80[a] *6*	100	93.29	$(5/2^+)$	E1		0.01725	α(K)=0.01478 *21*; α(L)=0.00196 *3*; α(M)=0.000410 *6* α(N)=9.10×10^{-5} *13*; α(O)=1.441×10^{-5} *21*; α(P)=9.82×10^{-7} *14* E_γ: 268.913 in ^{147}Ce β^- decay (1993Ma39). Mult.: from α(K)exp=0.0140 *4* in ^{147}Ce β^- decay (1993Ma39); M1+E2 (1981ScZM).
		358.95[b]	15.4[b]	2.67	$(5/2^+)$	(E1)		0.00828	α(K)=0.00710 *10*; α(L)=0.000929 *13*; α(M)=0.000194 *3* α(N)=4.33×10^{-5} *6*; α(O)=6.89×10^{-6} *10*; α(P)=4.82×10^{-7} *7* Mult.: from α(K)exp=0.0077 *11* for unresolved 359γ+359γ+361γ multiplet in ^{147}Ce β^- decay (1993Ma39).
		361.7[b]	1[b]	0.0	$(3/2^+)$				

$^{147}_{59}Pr_{88}$-4

$\gamma(^{147}$Pr) (continued)

E_i(level)	J^π_i	E_γ[#]	I_γ[#]	E_f	J^π_f	Mult.[@]	α[†]	Comments
384.77	(11/2⁻)	22.8[&]	≈27	362.03	(7/2⁻)			
		138.37[&]	100	246.52	(9/2⁺)	E1	0.1029	α(K)=0.0877 *13*; α(L)=0.01204 *17*; α(M)=0.00252 *4* α(N)=0.000557 *8*; α(O)=8.68×10^{-5} *13*; α(P)=5.44×10^{-6} *8* α(exp)=0.15 3 (2015Wa28, ^{252}Cf SF decay). Mult.: from 2015Wa28, ^{252}Cf SF decay.
452.32	(3/2⁻,5/2⁻)	358.96[b]	18[b]	93.29	(5/2⁺)	(E1)	0.00828	α(K)=0.00710 *10*; α(L)=0.000929 *13*; α(M)=0.000194 *3* α(N)=4.33×10^{-5} *6*; α(O)=6.89×10^{-6} *10*; α(P)=4.82×10^{-7} *7* Mult.: from α(K)exp=0.0077 *11* for unresolved 359γ+359γ+361γ multiplet in ^{147}Ce β^- decay (1993Ma39); assignment made tentative by evaluator.
		449.55	23	2.67	(5/2⁺)	(E1)	0.00481	α(K)=0.00413 *6*; α(L)=0.000536 *8*; α(M)=0.0001120 *16* α(N)=2.50×10^{-5} *4*; α(O)=3.99×10^{-6} *6*; α(P)=2.84×10^{-7} *4* Mult.: from α(K)exp=0.0034 *5* for unresolved 450γ+452γ multiplet (1993Ma39); assignment made tentative by evaluator.
		452.222	100	0.0	(3/2⁺)	(E1)	0.00474	α(K)=0.00408 *6*; α(L)=0.000528 *8*; α(M)=0.0001105 *16* α(N)=2.46×10^{-5} *4*; α(O)=3.93×10^{-6} *6*; α(P)=2.80×10^{-7} *4* Mult.: from α(K)exp=0.0034 *5* for unresolved 450γ+452γ multiplet (1993Ma39); assignment made tentative by evaluator.
467.48	(3/2⁻,5/2⁻)	105.59	1.3	362.03	(7/2⁻)			
		175.37	12	291.82	(5/2⁺)	(E1)	0.0539	α(K)=0.0460 *7*; α(L)=0.00622 *9*; α(M)=0.001303 *19* α(N)=0.000288 *4*; α(O)=4.53×10^{-5} *7*; α(P)=2.93×10^{-6} *5* Mult.: from α(K)exp=0.087 *8* in ^{147}Ce β^- decay (1993Ma39); comparing α(K)exp with calculated values, E1 is least discrepant.
		374.23[a] *6*	100	93.29	(5/2⁺)	E1	0.00747	α(K)=0.00641 *9*; α(L)=0.000838 *12*; α(M)=0.0001752 *25* α(N)=3.90×10^{-5} *6*; α(O)=6.21×10^{-6} *9*; α(P)=4.36×10^{-7} *7* E_γ: 374.313 in ^{147}Ce β^- decay (1993Ma39). Mult.: from α(K)exp=0.061 *6* in ^{147}Ce β^- decay (1993Ma39).
		464.713[b]	33[b]	2.67	(5/2⁺)	(E1)	0.00445	α(K)=0.00383 *6*; α(L)=0.000495 *7*; α(M)=0.0001035 *15* α(N)=2.31×10^{-5} *4*; α(O)=3.69×10^{-6} *6*; α(P)=2.63×10^{-7} *4* Mult.: from α(K)exp=0.0062 *15* in ^{147}Ce β^- decay (1993Ma39); comparing α(K)exp with calculated values, E1 is least discrepant.
		467.33	78	0.0	(3/2⁺)	E1	0.00439	α(K)=0.00378 *6*; α(L)=0.000489 *7*; α(M)=0.0001022 *15* α(N)=2.28×10^{-5} *4*; α(O)=3.64×10^{-6} *5*; α(P)=2.60×10^{-7} *4* Mult.: from α(K)exp=0.0047 *7* in ^{147}Ce β^- decay (1993Ma39).
470.69	(9/2⁺)	108.9	10	362.03	(7/2⁻)			
		178.72	94	291.82	(5/2⁺)	(E2)	0.278	α(K)=0.203 *3*; α(L)=0.0586 *9*; α(M)=0.01296 *19* α(N)=0.00282 *4*; α(O)=0.000409 *6*; α(P)=1.201×10^{-5} *17* Mult.: M1,E2 from α(K)exp=0.317 *13* in ^{147}Ce β^- decay (1993Ma39); (E2) more likely from β^- feeding pattern.
		377.59	85	93.29	(5/2⁺)			
		442.55	100	27.77	(7/2⁺)			
545.91	(9/2⁺)	161.56	35	384.77	(11/2⁻)			

$^{147}_{59}$Pr$_{88}$-5

$\gamma(^{147}$Pr) (continued)

E_i(level)	J^π_i	E_γ[#]	I_γ[#]	E_f	J^π_f	Mult.[@]	α[†]	Comments
545.91	(9/2$^+$)	183.8	1.7	362.03	(7/2$^-$)			
		254.09	100	291.82	(5/2$^+$)	E2	0.0859 *12*	α(K)=0.0671 *10*; α(L)=0.01479 *21*; α(M)=0.00323 *5* α(N)=0.000708 *10*; α(O)=0.0001053 *15*; α(P)=4.26$\times10^{-6}$ *6* Mult.: from α(K)exp=0.078 *3* in ^{147}Ce β^- decay (1993Ma39).
		299.63	10	246.52	(9/2$^+$)			
608.01	(7/2$^-$)	316.4	8	291.82	(5/2$^+$)			
		361.42[b]	14[b]	246.52	(9/2$^+$)			
		514.81	10	93.29	(5/2$^+$)			
		580.28	100	27.77	(7/2$^+$)	(E1)	0.00269	α(K)=0.00232 *4*; α(L)=0.000297 *5*; α(M)=6.21$\times10^{-5}$ *9* α(N)=1.384$\times10^{-5}$ *20*; α(O)=2.22$\times10^{-6}$ *4*; α(P)=1.609$\times10^{-7}$ *23* Mult.: from α(K)exp=0.0027 *4* for unresolved 579γ+580γ multiplet in ^{147}Ce β^- decay (1993Ma39); assignment made tentative by evaluator.
		605.4	36	2.67	(5/2$^+$)	(E1)	0.00245	α(K)=0.00211 *3*; α(L)=0.000270 *4*; α(M)=5.65$\times10^{-5}$ *8* α(N)=1.260$\times10^{-5}$ *18*; α(O)=2.02$\times10^{-6}$ *3*; α(P)=1.469$\times10^{-7}$ *21* Mult.: K-conversion peak not observed, thus excluding M1+E2 in ^{147}Ce β^- decay (1993Ma39).
638.00	(3/2,5/2,7/2$^-$)	185.7	84	452.32	(3/2$^-$,5/2$^-$)			
		544.89	100	93.29	(5/2$^+$)			
641.4	(15/2$^-$)	256.6[&] *5*	100	384.77	(11/2$^-$)			
701.32	(5/2$^-$)	233.95	5	467.48	(3/2$^-$,5/2$^-$)			
		248.5	12	452.32	(3/2$^-$,5/2$^-$)			
		455.3	5	246.52	(9/2$^+$)			
		607.60	33	93.29	(5/2$^+$)			
		698.59	23	2.67	(5/2$^+$)			
		701.13	100	0.0	(3/2$^+$)	(E1)	0.00180	α(K)=0.001547 *22*; α(L)=0.000197 *3*; α(M)=4.11$\times10^{-5}$ *6* α(N)=9.17$\times10^{-6}$ *13*; α(O)=1.473$\times10^{-6}$ *21*; α(P)=1.081$\times10^{-7}$ *16* Mult.: K-conversion peak not observed excludes M1+E2 in ^{147}Ce β^- decay (1993Ma39).
748.88	(5/2$^+$,7/2)	202.87	21	545.91	(9/2$^+$)			
		386.8	29	362.03	(7/2$^-$)			
		456.9	19	291.82	(5/2$^+$)			
		502.31	45	246.52	(9/2$^+$)			
		656.07	52	93.29	(5/2$^+$)			
		746.36	100	2.67	(5/2$^+$)			
783.6		537.10	100	246.52	(9/2$^+$)			
802.84	(5/2$^+$)	335.2	35	467.48	(3/2$^-$,5/2$^-$)			
		350.4	13	452.32	(3/2$^-$,5/2$^-$)			
		440.62	71	362.03	(7/2$^-$)			
		510.9[b]	12[b]	291.82	(5/2$^+$)			
		709.4	17	93.29	(5/2$^+$)			
		802.86	100	0.0	(3/2$^+$)	(M1+E2)	0.0044 *10*	α(K)=0.0037 *8*; α(L)=0.00050 *9*; α(M)=0.000106 *19*

$\gamma(^{147}Pr)$ (continued)

E_i(level)	J^{π}_i	E_γ[#]	I_γ[#]	E_f	J^{π}_f	Comments
						α(N)=2.4×10^{-5} *5*; α(O)=3.8×10^{-6} *7*; α(P)=2.7×10^{-7} *7* Mult.: from α(K)exp=0.009 *2* for unresolved 800γ+802γ multiplet in ^{147}Ce β^- decay (1993Ma39).
931.57	(3/2,5/2,7/2+)	464.2[b]	58[b]	467.48	(3/2−,5/2−)	
		639.3	35	291.82	(5/2+)	
		838.62	15	93.29	(5/2+)	
		931.57	100	0.0	(3/2+)	
951.63	(5/2+,7/2+)	484.56	47	467.48	(3/2−,5/2−)	
		659.15[b]	54[b]	291.82	(5/2+)	
		705.6[b]	12[b]	246.52	(9/2+)	
		857.87	100	93.29	(5/2+)	
		949.13	47	2.67	(5/2+)	
		951.93[b]	71[b]	0.0	(3/2+)	
961.06	(5/2+,7/2)	414.8	48	545.91	(9/2+)	
		489.99	61	470.69	(9/2+)	
		493.44	100	467.48	(3/2−,5/2−)	
		599.52	90	362.03	(7/2−)	
		714.9	32	246.52	(9/2+)	
978.07	(7/2−)	510.4[b]	22[b]	467.48	(3/2−,5/2−)	
		593.29[b]	100[b]	384.77	(11/2−)	
		616.0	57	362.03	(7/2−)	
1045.94	(3/2−,5/2)	297.37	35	748.88	(5/2+,7/2)	
		344.25	32	701.32	(5/2−)	
		578.5	49	467.48	(3/2−,5/2−)	
		593.0[b]	46[b]	452.32	(3/2−,5/2−)	
		684.2	25	362.03	(7/2−)	
		754.66	20	291.82	(5/2+)	
		952.3[b]	10[b]	93.29	(5/2+)	
		1045.82	100	0.0	(3/2+)	
1058.90	(7/2−,9/2+)	674.08	100	384.77	(11/2−)	
		1056.27	68	2.67	(5/2+)	
1065.3	(19/2−)	423.9[&] *5*	100	641.4	(15/2−)	
1068.05	(7/2+)	682.9	15	384.77	(11/2−)	
		705.7[b]	27[b]	362.03	(7/2−)	
		776.53	100	291.82	(5/2+)	
		1065.41	65	2.67	(5/2+)	
		1068.40	23	0.0	(3/2+)	
1159.58	(3/2,5/2,7/2−)	707.4	83	452.32	(3/2−,5/2−)	
		1156.77	100	2.67	(5/2+)	
1170.21	(7/2+)	785.67	88	384.77	(11/2−)	
		808.2	62	362.03	(7/2−)	

γ(^{147}Pr) (continued)

E_i(level)	J^π_i	E_γ[#]	I_γ[#]	E_f	J^π_f
1170.21	(7/2$^+$)	878.5	42	291.82	(5/2$^+$)
		1170.5	100	0.0	(3/2$^+$)
1172.88	(3/2$^-$,5/2,7/2$^-$)	705.5[b]	100[b]	467.48	(3/2$^-$,5/2$^-$)
		721.0	66	452.32	(3/2$^-$,5/2$^-$)
		810.3	36	362.03	(7/2$^-$)
1194.43	(5/2$^+$,7/2$^+$)	649.13	14	545.91	(9/2$^+$)
		727.01	34	467.48	(3/2$^-$,5/2$^-$)
		832.346	100	362.03	(7/2$^-$)
		1100.94	46	93.29	(5/2$^+$)
		1166.2	18	27.77	(7/2$^+$)
		1193.97	9	0.0	(3/2$^+$)
1267.30	(5/2$^+$,7/2)	659.6[b]	5[b]	608.01	(7/2$^-$)
		796.8	75	470.69	(9/2$^+$)
		799.81[b]	≈49[b]	467.48	(3/2$^-$,5/2$^-$)
		1264.13	100	2.67	(5/2$^+$)
1285.79	(3/2$^-$,5/2,7/2$^-$)	818.22	52	467.48	(3/2$^-$,5/2$^-$)
		833.5	73	452.32	(3/2$^-$,5/2$^-$)
		923.79	100	362.03	(7/2$^-$)
1601.4	(23/2$^-$)	536.1[&] 5		1065.3	(19/2$^-$)
1724.93	(5/2$^+$,7/2$^+$)	530.7	36	1194.43	(5/2$^+$,7/2$^+$)
		773.53	100	951.63	(5/2$^+$,7/2$^+$)
		921.5		802.84	(5/2$^+$)
		1116.42	45	608.01	(7/2$^-$)
		1179.1	28	545.91	(9/2$^+$)
		1478.7	12	246.52	(9/2$^+$)
		1725.2	9	0.0	(3/2$^+$)
1845.92	(5/2,7/2$^-$)	676.4	30	1170.21	(7/2$^+$)
		799.7[b]	15[b]	1045.94	(3/2$^-$,5/2)
		867.98	100	978.07	(7/2$^-$)
		1042.9		802.84	(5/2$^+$)
		1378.29	39	467.48	(3/2$^-$,5/2$^-$)
		1393.72	58	452.32	(3/2$^-$,5/2$^-$)
		1483.51	47	362.03	(7/2$^-$)
1856.34	(3/2$^-$,5/2,7/2)	1388.81	100	467.48	(3/2$^-$,5/2$^-$)
		1494.3	75	362.03	(7/2$^-$)
		1564.53	23	291.82	(5/2$^+$)
1864.94	(3/2$^-$,5/2$^-$,7/2$^-$)	1062.14	84	802.84	(5/2$^+$)
		1227.13	100	638.00	(3/2,5/2,7/2$^-$)
		1257.0	69	608.01	(7/2$^-$)
1864.94	(3/2$^-$,5/2$^-$,7/2$^-$)	1397.49	71	467.48	(3/2$^-$,5/2$^-$)
		1412.52	65	452.32	(3/2$^-$,5/2$^-$)
		1572.8		291.82	(5/2$^+$)
		1862.3	27	2.67	(5/2$^+$)
1943.85	(7/2$^-$)	965.4	9	978.07	(7/2$^-$)
		1335.93	66	608.01	(7/2$^-$)
		1473.16	46	470.69	(9/2$^+$)
		1476.60	100	467.48	(3/2$^-$,5/2$^-$)
		1491.84	65	452.32	(3/2$^-$,5/2$^-$)
		1582.06	22	362.03	(7/2$^-$)
		1697.29	22	246.52	(9/2$^+$)
		1850.0	70	93.29	(5/2$^+$)
		1915.8	9	27.77	(7/2$^+$)
		1941.5	41	2.67	(5/2$^+$)
2060.58	(5/2,7/2)	1452.88	65	608.01	(7/2$^-$)
		1768.4	72	291.82	(5/2$^+$)
		2032.5	5	27.77	(7/2$^+$)
		2058.2	100	2.67	(5/2$^+$)
2135.32	(7/2$^-$)	1589.51	51	545.91	(9/2$^+$)
		1773.4	100	362.03	(7/2$^-$)
		1843.5	35	291.82	(5/2$^+$)
		2107.3	79	27.77	(7/2$^+$)
2182.85	(7/2$^-$)	987.76	100	1194.43	(5/2$^+$,7/2$^+$)
		1637.2	52	545.91	(9/2$^+$)
		1798.0	30	384.77	(11/2$^-$)
		1936.8	75	246.52	(9/2$^+$)
		2089.4	41	93.29	(5/2$^+$)
		2180.3	13	2.67	(5/2$^+$)
2209.3	(27/2$^-$)	607.9[&] 5		1601.4	(23/2$^-$)
2249.64	(7/2$^-$)	1548.08	100	701.32	(5/2$^-$)
		1779.0	94	470.69	(9/2$^+$)
		1887.8	34	362.03	(7/2$^-$)
		2246.9	27	2.67	(5/2$^+$)
2869.8	(31/2$^-$)	660.5[&] 5	100	2209.3	(27/2$^-$)
253.5+x		253.5[&] 5	100	x	
628.1+x		374.6[&] 5	100	253.5+x	
1122.9+x		494.8[&] 5	100	628.1+x	
1665.5+x		542.6[&] 5	100	1122.9+x	

From ENSDF

$^{147}_{59}$Pr$_{88}$-8

γ(^{147}Pr) (continued)

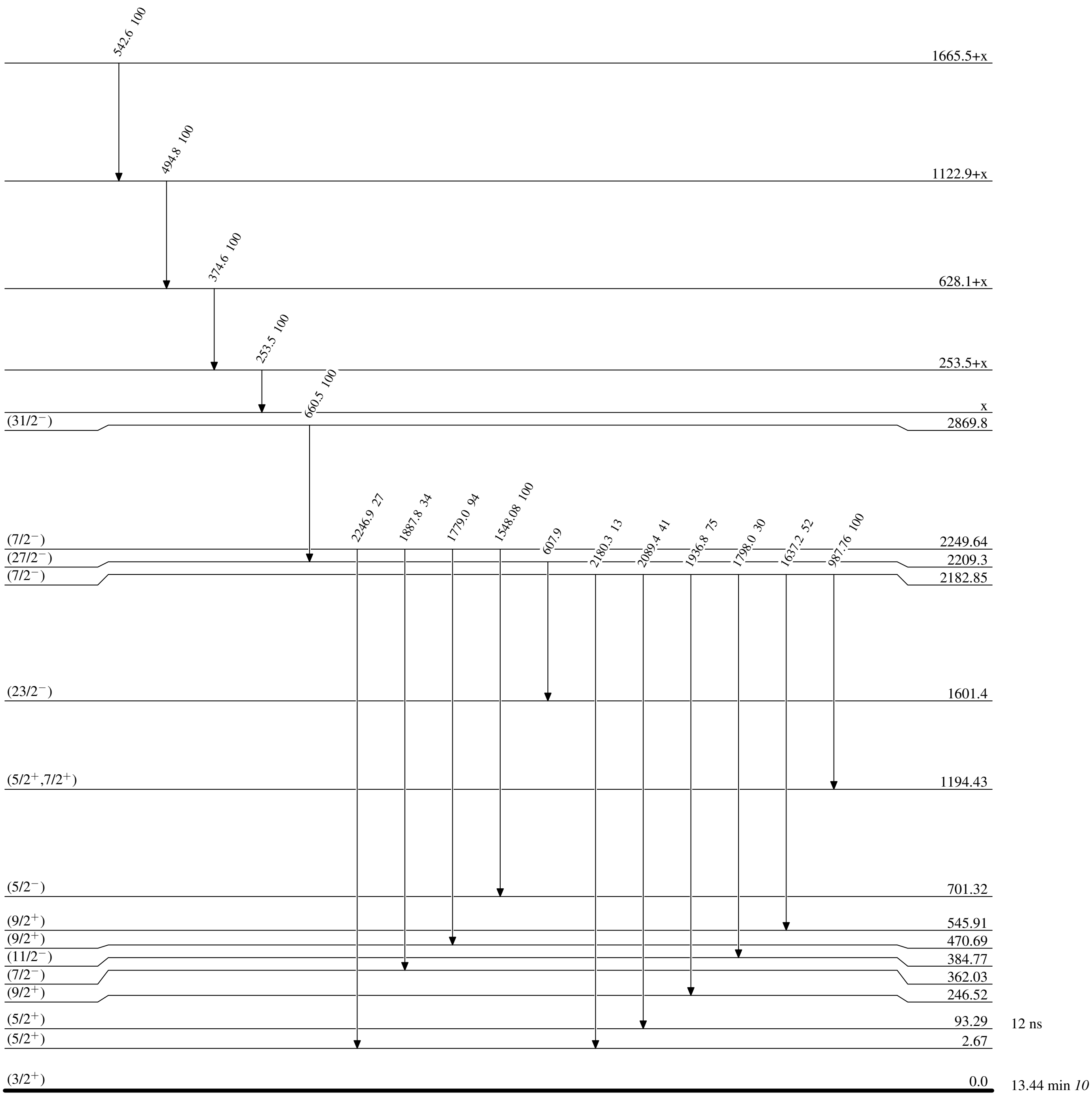
† Additional information 2.
‡ Additional information 3.
\# From ^{147}Ce β^- decay unless otherwise noted.
@ Unless otherwise noted from 1981ScZM (see ^{147}Ce β^- decay) based on γ-ray, conversion electron studies and K/L ratios (values not given), except as noted.
& From ^{252}Cf SF decay dataset (2015Wa28).
[a] Eγ is from measurements with curved crystal spectrometers (1979Bo26, see ^{147}Ce β^- decay).
[b] Multiply placed with intensity suitably divided.

$^{147}_{59}$Pr$_{88}$-9

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level

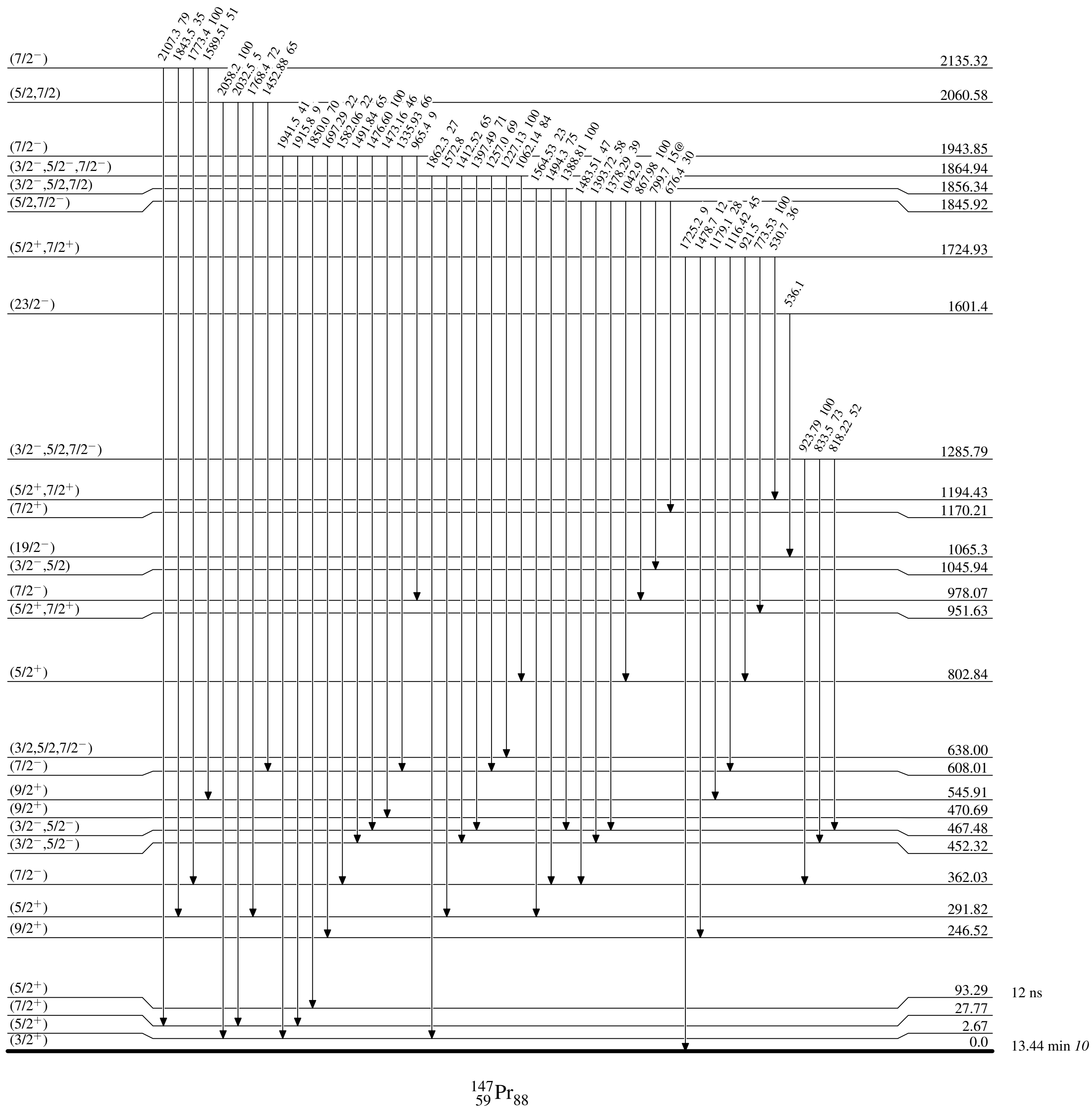


$^{147}_{59}Pr_{88}$

Adopted Levels, Gammas

Level Scheme (continued)

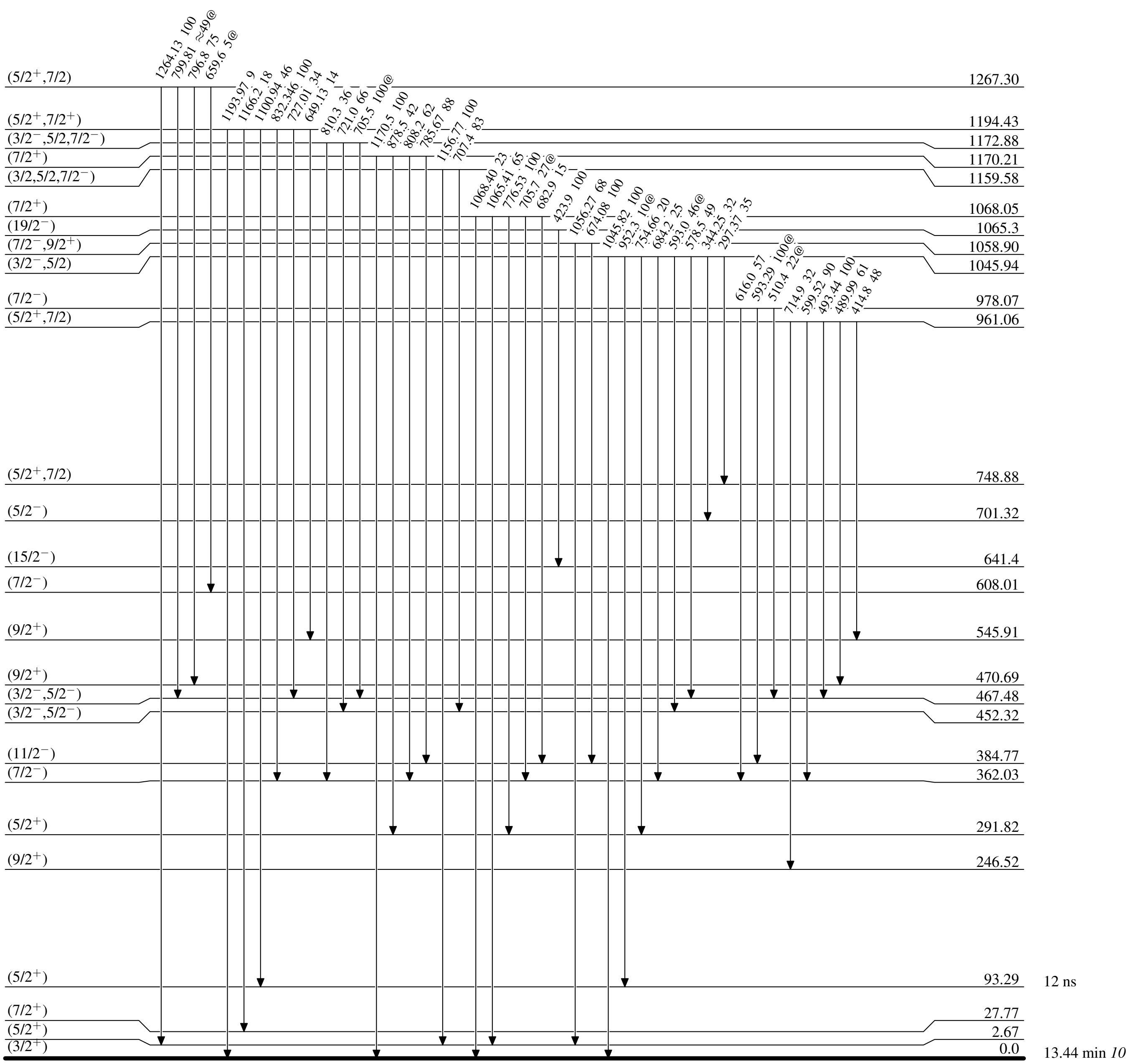
Intensities: Relative photon branching from each level
@ Multiply placed: intensity suitably divided



Adopted Levels, Gammas

Level Scheme (continued)

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

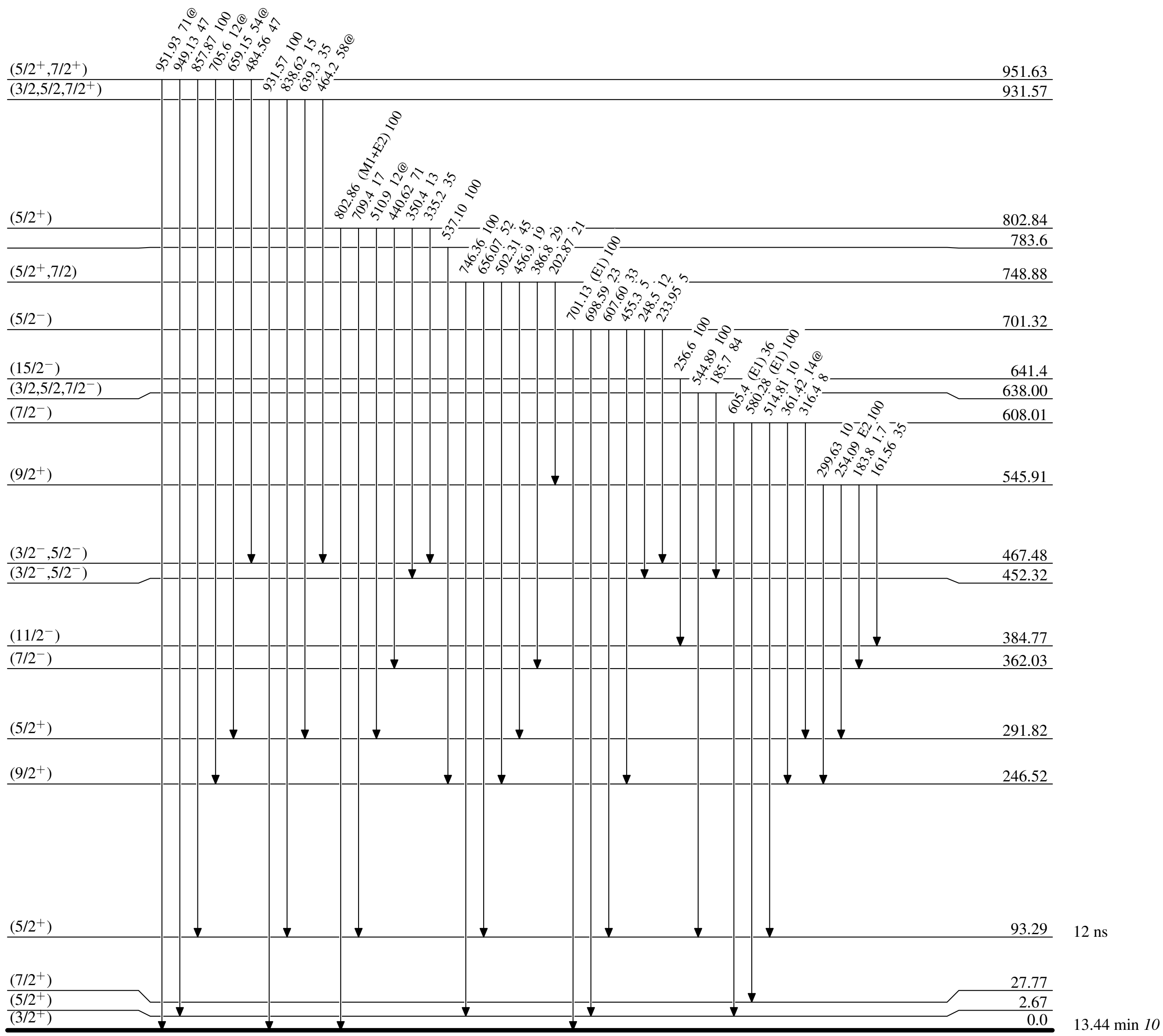


$^{147}_{59}Pr_{88}$

Adopted Levels, Gammas

Level Scheme (continued)

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



$^{147}_{59}Pr_{88}$

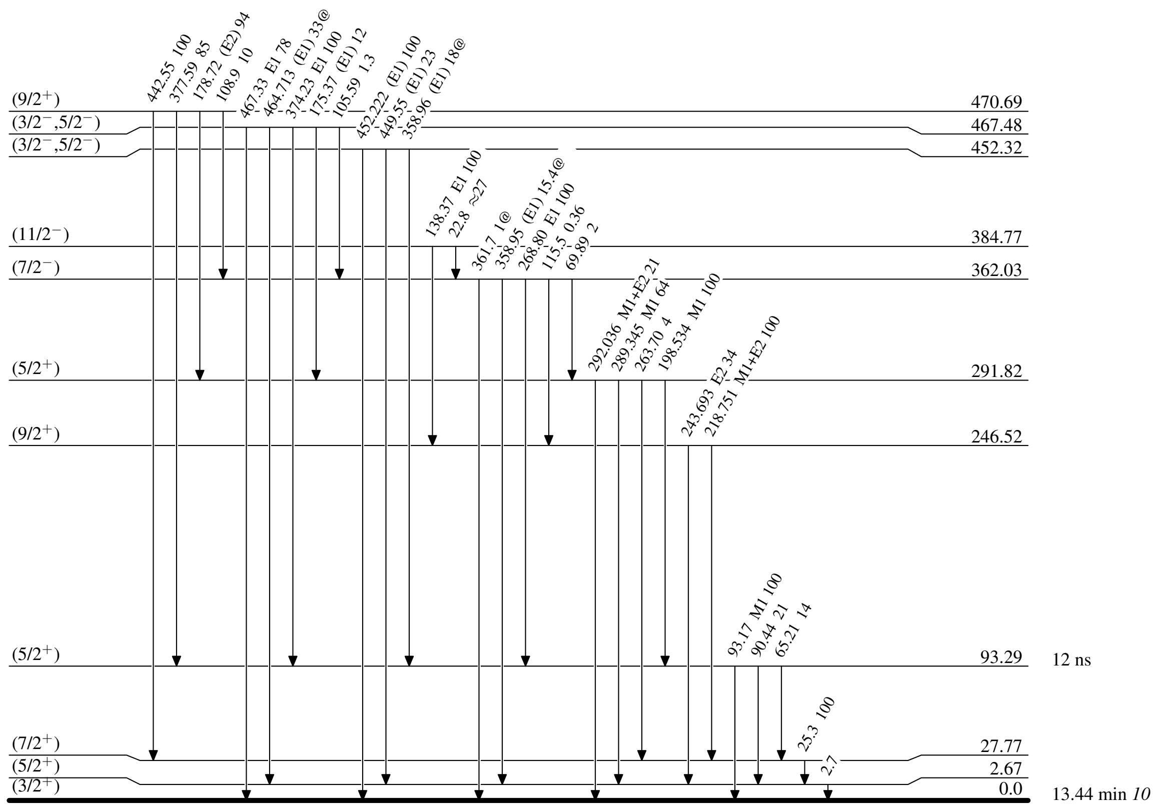
Adopted Levels, Gammas

Level Scheme (continued)

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

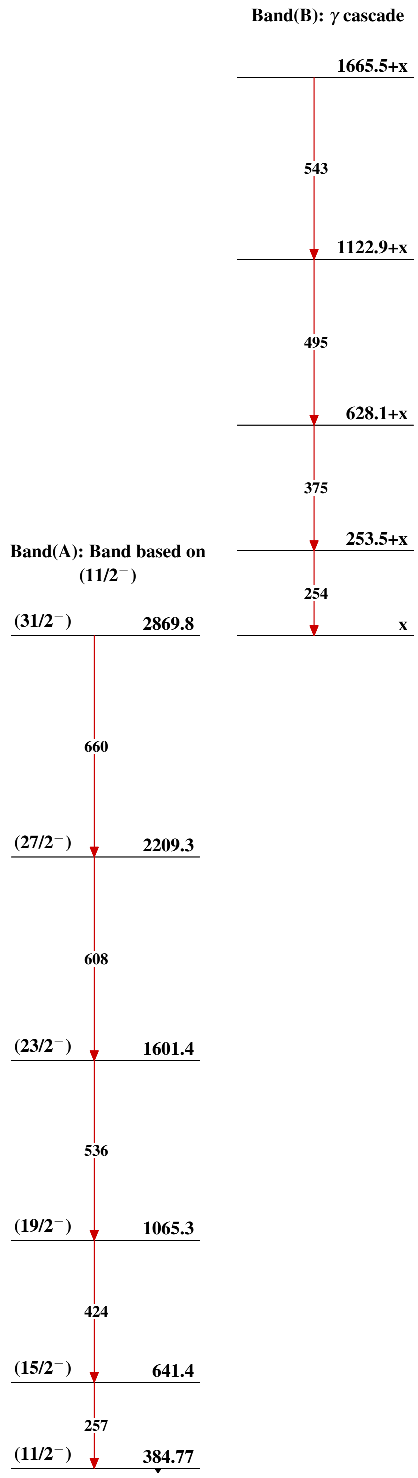
Legend

γ Decay (Uncertain)



$^{147}_{59}Pr_{88}$

Adopted Levels, Gammas



$^{147}_{59}Pr_{88}$