^{139}Nd ε decay (5.50 h) 1975Vy02,1971Bu22,1969Be64

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	P. K. Joshi, B. Singh, S. Singh, A. K. Jain	NDS 138, 1 (2016)	15-Oct-2016

Parent: ^{139}Nd: E=231.15 *5*; J^π=11/2$^-$; $T_{1/2}$=5.50 h *20*; Q(ε)=2806 *28*; %ε+%β^+ decay=87.0 *10*

^{139}Nd-Q(ε): From 2012Wa38.

^{139}Nd-%ε+%β^+ decay: From I(γ+ce)(231γ in IT decay)+ΣI(γ+ce)(to 113.9 level)+ ΣI(γ+ce)(822.1γ+827.8γ+852γ)=100. It is assumed that there is no direct ε+β^+ feeding to the g.s. and the 113.87 level. Value of I(γ+ce) for 231γ (in ^{139}Nd IT decay) is deduced in two ways: 1. from measured Iγ(231γ)=2.35 *20* (average of values from 1971Bu22 and 1969Be64); 2. from I(ceK) data for 231γ, Iγ and I(ceK) data for five strong γ rays (1971Bu22) in ^{139}Pr were used to determine an average conversion factor of 43.1 *25* to normalize the ce(K) and Iγ data in 1971Bu22 on the same scale, which is then used to obtain I(γ+ce) for 231γ. Values of branching ratios are: 87.2% *11* using measured Iγ of 231γ and 86.6% *15* from measured I(ceK) value of 231γ. Weighted average of the two results is 87.0% *10* for %(ε+β^+), and 13.0 *10* for IT decay. Other: %IT=14.3% *14* (1971Bu22) from comparison of ce(K)(165.84γ; ^{139}Ce) to ce(K)(231.15γ).

See 29.7-min ε decay for experimental details.

1972Kr24 measured 114γ-708γ(θ) and 114γ-738γ(θ) (Ge(Li),NaI) and (700-900γ)(900-1100γ)(t) (NaI; ≈5 half-lives). Chem.

Others: 1964So03, 1968BaZW, 1969Be64, 1969He10, 1972Kr24, 1982PrZV, 1988IsZX.

All data and decay scheme from 1971Bu22, except as noted.

^{139}Pr Levels

E(level)	J^π†	$T_{1/2}$	Comments
0.0	5/2$^+$		%ε+%β^+=100
113.87 *5*	7/2$^+$	2.60 ns *8*	$T_{1/2}$: from 1968BaZW.
822.00 *10*	11/2$^-$‡	36.8 ns *20*	$T_{1/2}$: from 1972Kr24. Other: 40 ns *2* (1969Be64).
828.09 *18*	9/2$^+$		
851.96 *14*	11/2$^+$‡		
1023.94 *19*	9/2$^+$		
1369.71 *12*	(9/2$^-$,11/2$^-$)		
1523.21 *11*	13/2$^-$		
1584.4?# *6*			
1624.37 *11*	9/2$^-$		
1722.0?# *5*	15/2$^-$		
1834.06 *11*	(9/2$^-$,11/2$^-$)		
1926.98 *12*	(11/2,13/2)$^-$		
2048.64 *12*	9/2$^-$,11/2$^-$		
2174.55 *14*	9/2$^-$		
2196.52 *12*	(9/2$^-$,11/2$^-$,13/2$^-$)		
2292.0 *4*	(9/2,11/2,13/2$^+$)		

† From the Adopted Levels, except as noted.

‡ From γγ(θ) and multipolarities of deexciting gammas.

Suggested by evaluators based on reaction γ data.

ε,β^+ radiations

E(decay)	E(level)	Iε‡	Log *ft*	I(ε+β^+)‡	Comments
(7.5×10^2 *3*)	2292.0	0.92 *18*	6.81 *10*	0.92 *18*	εK=0.8374 *6*; εL=0.1264 *5*; εM+=0.03620 *14*
(8.4×10^2 *3*)	2196.52	5.6 *4*	6.14 *5*	5.6 *4*	εK=0.8390 *5*; εL=0.1252 *4*; εM+=0.03580 *11*
(8.6×10^2 *3*)	2174.55	7.4 *6*	6.04 *5*	7.4 *6*	εK=0.8393 *4*; εL=0.1250 *3*; εM+=0.03572 *11*
(9.9×10^2 *3*)	2048.64	4.9 *4*	6.34 *5*	4.9 *4*	εK=0.8408 *3*; εL=0.12383 *23*; εM+=0.03533 *8*
(1.11×10^3 *3*)	1926.98	12.5 *11*	6.04 *5*	12.5 *11*	εK=0.8420 *3*; εL=0.12299 *18*; εM+=0.03505 *6*

Continued on next page (footnotes at end of table)

^{139}Nd ε decay (5.50 h) 1975Vy02,1971Bu22,1969Be64 (continued)

ϵ,β^+ radiations (continued)

E(decay)	E(level)	Iβ^+ [‡]	Iε [‡]	Log *ft*	I($\varepsilon+\beta^+$) [‡]	Comments
(1.20×10^3 *3*)	1834.06	0.0019 *18*	33.8 *16*	5.68 *4*	33.8 *16*	av Eβ=93 *14*; εK=0.8426 *2*; εL=0.12246 *16*; εM+=0.03487 *5*
(1.32×10^3 [#] *3*)	1722.0?		0.39 *7*	7.70 *9*	0.39 *7*	εK=0.8429; εL=0.12187 *15*; εM+=0.03468 *5*
(1.41×10^3 *3*)	1624.37	0.017 *6*	9.9 *10*	6.36 *5*	9.9 *10*	av Eβ=187 *13*; εK=0.8425 *4*; εL=0.12133 *17*; εM+=0.03451 *6*
(1.45×10^3 [#] *3*)	1584.4?	0.0015 *5*	0.58 *11*	7.6 *1*	0.58 *11*	av Eβ=205 *13*; εK=0.8419 *5*; εL=0.12109 *19*; εM+=0.03443 *6*
(1.51×10^3 [#] *3*)	1523.21	0.003 *2*	0.6 *5*	7.6 *4*	0.6 *5*	av Eβ=232 *13*; εK=0.8407 *8*; εL=0.12067 *22*; εM+=0.03430 *7*
(1.67×10^3 *3*)	1369.71	0.013 *3*	1.1 *2*	7.5 *1*	1.1 *2*	av Eβ=299 *13*; εK=0.8347 *17*; εL=0.1193 *4*; εM+=0.03389 *10*
(2.19×10^3 *3*)	851.96	0.21 *8*	2.1 *8*	7.4 *2*	2.3 *9*	av Eβ=526 *13*; εK=0.770 *6*; εL=0.1089 *9*; εM+=0.03089 *25*
(2.21×10^3 [#] *3*)	828.09	0.10 *8*	0.9 *7*	7.8 *4*	1.0 *8*	av Eβ=537 *13*; εK=0.765 *6*; εL=0.1082 *9*; εM+=0.0307 *3*
(2.22×10^3 [†] *3*)	822.00	0.66 *15*	6.1 *14*	6.96 *10*	6.8 *15*	av Eβ=539 *13*; εK=0.764 *6*; εL=0.1080 *9*; εM+=0.0306 *3* E(decay): 2192 *50* from measured Eβ^+ value. Iβ^+: other: 1.19% *35* (1975Vy02).
(2.92×10^3 [#] *3*)	113.87	<1.3	<8.7	>8.6[1u]	<10	av Eβ=868 *13*; εK=0.730 *6*; εL=0.1051 *8*; εM+=0.02991 *23*

† 1975Vy02 obtained the same value.
‡ Absolute intensity per 100 decays.
# Existence of this branch is questionable.

γ(^{139}Pr)

Iγ normalization: From ΣI(γ+ce)(to 113.9 level)+ΣI(γ+ce)(γ rays to g.s., except the 113.9γ)=100, assuming no direct feeding of g.s. (none expected for a ΔJ=3, yes β transition) and the 113.9 level (as evidenced by γ-transition intensity balance at this level).

Coincidences shown on drawing are from 1969Be64 and 1972Kr24. See 1969Be64 for possible coincidences.

α(K)exp: normalized to α(K)(231γ ^{139}Nd; M4)=9.5.

1975Vy02 reported the following γ's with $T_{1/2}$=5.5 h or 29.7 min:

Eγ	Iγ†	Eγ	Iγ†	Eγ	Iγ†	Eγ	Iγ†
204.3 3	0.40 6	558.5 5	0.90 14	1204.2 5	0.25 4	1440.5 5	0.11 3
326.0 4	1.04 15	695.5 4	1.46 23	1250.0 8	0.20 4	1948.0 7	0.05 2
343.1 5	1.55 22	845.5 6	0.22 6	1305.7 6	0.18 3	1960.0 7	0.11 3
419.5 5	0.51 7	870.5 5	0.50 9	1400.0 4	0.22 4	2052.0 7	0.16 5
431.2 6	0.78 14	963.0 5	0.26 7	1412.0 5	0.17 4	2285.5 5	0.06 2
463.8 4	1.15 14	1031.5 5	0.65 9	1421.3 5	0.19 5		

† Relative to Iγ(738γ)=100.

E_γ	I_γ[b]	E_i(level)	J^π_i	E_f	J^π_f	Mult.†	δ†	α[c]	Comments
92.91 7	2.9 6	1926.98	(11/2,13/2)$^-$	1834.06	(9/2$^-$,11/2$^-$)	M1,E2		2.2 6	α(K)exp=1.4 5 α(K)=1.43 7; α(L)=0.6 4; α(M)=0.13 10 α(N)=0.029 20; α(O)=0.004 3; α(P)=9.1×10^{-5} 14
101.20 10	0.50 15	1624.37	9/2$^-$	1523.21	13/2$^-$	E2		2.03	α(K)exp=1.5 7 α(K)=1.171 17; α(L)=0.671 10; α(M)=0.1512 23 α(N)=0.0327 5; α(O)=0.00457 7; α(P)=6.12×10^{-5} 9 Mult.: M1,E2 from α_K(exp); ≠M1 from ΔJ.
113.87 5	113 13	113.87	7/2$^+$	0.0	5/2$^+$	M1+E2	0.16 10	0.906 22	α(K)exp=0.86 13 α(K)=0.763 11; α(L)=0.112 12; α(M)=0.024 3 α(N)=0.0053 6; α(O)=0.00084 8; α(P)=5.81×10^{-5} 10 K:L1:L2:L3:M:N+=4450 150:685 25:73 7:42 4:119 6:24.0 25.
147.9 1	1.77 23	2196.52	(9/2$^-$,11/2$^-$,13/2$^-$)	2048.64	9/2$^-$,11/2$^-$	(E2,M1)		0.48 6	α(K)exp=0.36 14 α(K)=0.367 6; α(L)=0.09 4; α(M)=0.020 9 α(N)=0.0043 20; α(O)=0.0006 3; α(P)=2.4×10^{-5} 4
^{x}151.4 2	≤0.2								α(K)exp≥0.45
^{x}172.1 2	≤0.2								α(K)exp≥0.57 171.2 2, Iγ=0.18 7 (1975Vy02) probably corresponds to this γ.

$\gamma(^{139}$Pr) (continued)

E_γ	I_γ[b]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	δ[†]	α[c]	Comments
209.65 *7*	5.1 *5*	1834.06	(9/2⁻,11/2⁻)	1624.37	9/2⁻	(M1,E2)		0.1629 *25*	α(K)exp=0.16 *3* α(K)=0.131 *9*; α(L)=0.025 *6*; α(M)=0.0054 *14* α(N)=0.0012 *3*; α(O)=0.00018 *4*; α(P)=9.1×10⁻⁶ *16*
214.6 *1*	1.4 *2*	2048.64	9/2⁻,11/2⁻	1834.06	(9/2⁻,11/2⁻)	E2,M1		0.152 *3*	α(K)exp=0.09 *4* α(K)=0.123 *9*; α(L)=0.023 *6*; α(M)=0.0050 *13* α(N)=0.0011 *3*; α(O)=0.00017 *4*; α(P)=8.5×10⁻⁶ *16*
254.6 *1*	3.4 *4*	1624.37	9/2⁻	1369.71	(9/2⁻,11/2⁻)	M1,E2		0.091 *6*	α(K)exp=0.084 *25* α(K)=0.075 *9*; α(L)=0.0129 *18*; α(M)=0.0028 *5* α(N)=0.00061 *9*; α(O)=9.5×10⁻⁵ *10*; α(P)=5.3×10⁻⁶ *11*
302.7 *4*	1.60 *25*	1926.98	(11/2,13/2)⁻	1624.37	9/2⁻	[M1,E2]		0.055 *7*	α(K)=0.046 *7*; α(L)=0.0074 *4*; α(M)=0.00159 *11* α(N)=0.000352 *21*; α(O)=5.47×10⁻⁵ *15*; α(P)=3.3×10⁻⁶ *8*
340.5 *1*	1.72 *25*	2174.55	9/2⁻	1834.06	(9/2⁻,11/2⁻)	M1,E2		0.040 *6*	α(K)exp=0.049 *12* α(K)=0.033 *6*; α(L)=0.00516 *8*; α(M)=0.001100 *22* α(N)=0.000244 *4*; α(O)=3.82×10⁻⁵ *11*; α(P)=2.4×10⁻⁶ *6*
362.42 *8*	6.6 *5*	2196.52	(9/2⁻,11/2⁻,13/2⁻)	1834.06	(9/2⁻,11/2⁻)	(E2)		0.0283	α(K)exp=0.0185 *50* α(K)=0.0230 *4*; α(L)=0.00417 *6*; α(M)=0.000900 *13* α(N)=0.000198 *3*; α(O)=3.03×10⁻⁵ *5*; α(P)=1.542×10⁻⁶ *22*
403.75 *8*	6.8 *6*	1926.98	(11/2,13/2)⁻	1523.21	13/2⁻	(M1)		0.0290	α(K)exp=0.032 *8* α(K)=0.0248 *4*; α(L)=0.00331 *5*; α(M)=0.000695 *10* α(N)=0.0001555 *22*; α(O)=2.51×10⁻⁵ *4*; α(P)=1.88×10⁻⁶ *3*
424.3 *1*	2.15 *25*	2048.64	9/2⁻,11/2⁻	1624.37	9/2⁻	M1,E2		0.022 *4*	α(K)exp=0.030 *10* α(K)=0.018 *4*; α(L)=0.00270 *22*; α(M)=0.00057 *4* α(N)=0.000127 *10*; α(O)=2.01×10⁻⁵ *20*; α(P)=1.3×10⁻⁶ *4*
[x]475.5 *2*	1.75 *25*								
547.65 *10*	6.7 *5*	1369.71	(9/2⁻,11/2⁻)	822.00	11/2⁻	M1		0.01344	α(K)exp=0.015 *4* α(K)=0.01151 *17*; α(L)=0.001518 *22*; α(M)=0.000319 *5* α(N)=7.13×10⁻⁵ *10*; α(O)=1.152×10⁻⁵ *17*; α(P)=8.67×10⁻⁷ *13*
572.3 *2*	2.2 *4*	2196.52	(9/2⁻,11/2⁻,13/2⁻)	1624.37	9/2⁻	(M1)		0.01204	α(K)exp=0.015 *8* α(K)=0.01032 *15*; α(L)=0.001360 *19*; α(M)=0.000285 *4* α(N)=6.38×10⁻⁵ *9*; α(O)=1.032×10⁻⁵ *15*; α(P)=7.76×10⁻⁷ *11*
601.2 *4*	1.60 *25*	1624.37	9/2⁻	1023.94	9/2⁺				
673.3 *3*	1.76 *20*	2196.52	(9/2⁻,11/2⁻,13/2⁻)	1523.21	13/2⁻	(M1,E2)		0.0067 *15*	α(K)exp=0.0062 *20* α(K)=0.0057 *13*; α(L)=0.00078 *13*; α(M)=0.00016 *3* α(N)=3.7×10⁻⁵ *6*; α(O)=5.9×10⁻⁶ *11*; α(P)=4.2×10⁻⁷ *11*

From ENSDF

γ(^{139}Pr) (continued)

E_γ	I_γ[b]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[†]	δ[†]	α[c]	Comments
									α(P)=4.2×10^{-7} 11
701.2 1	11.8 12	1523.21	13/2$^-$	822.00	11/2$^-$	M1,E2		0.0060 13	α(K)exp=0.0074 15 α(K)=0.0051 12; α(L)=0.00070 12; α(M)=0.000148 25 α(N)=3.3×10^{-5} 6; α(O)=5.3×10^{-6} 10; α(P)=3.8×10^{-7} 10
708.1 1	74.8 32	822.00	11/2$^-$	113.87	7/2$^+$	M2+E3[‡]	+0.07[#] 4	0.0199	α(K)=0.01686 25; α(L)=0.00240 4; α(M)=0.000509 8 α(N)=0.0001140 17; α(O)=1.84×10^{-5} 3; α(P)=1.347×10^{-6} 20
732.4[@ad] 5	1.64[@] 26	1584.4?		851.96	11/2$^+$				
738.2 3	100	851.96	11/2$^+$	113.87	7/2$^+$	E2+M3[‡]	+0.20[#] 4	0.0056 6	α(K)exp=0.0041 4; K:L:M+=18.8 19:2.2 25:0.50 8 α(K)=0.0047 5; α(L)=0.00070 8; α(M)=0.000149 18 α(N)=3.3×10^{-5} 4; α(O)=5.3×10^{-6} 7; α(P)=3.6×10^{-7} 5 Mult.,δ: stretched E2 from $\gamma(\theta)$ and α(K)exp in (^{3}He,3nγ) are discrepant.
772.5[@&d] 6	1.15[@] 20	1624.37	9/2$^-$	851.96	11/2$^+$				
796.5 3	11.9 12	1624.37	9/2$^-$	828.09	9/2$^+$	E1		1.38×10^{-3}	α(K)exp=0.0009 3 α(K)=0.001193 17; α(L)=0.0001511 22; α(M)=3.15×10^{-5} 5 α(N)=7.04×10^{-6} 10; α(O)=1.131×10^{-6} 16; α(P)=8.35×10^{-8} 12
802.0 3	19.8 20	1624.37	9/2$^-$	822.00	11/2$^-$	E2(+M1)	>2.4	0.00360 15	α(K)exp=0.0026 6; K/L=8.0 24 α(K)=0.00306 13; α(L)=0.000428 15; α(M)=9.0×10^{-5} 3 α(N)=2.01×10^{-5} 7; α(O)=3.20×10^{-6} 12; α(P)=2.20×10^{-7} 10
809.6 3	18.0 18	1834.06	(9/2$^-$,11/2$^-$)	1023.94	9/2$^+$	E1		1.34×10^{-3}	α(K)exp=0.00105 25; K/L=7.5 22 α(K)=0.001155 17; α(L)=0.0001461 21; α(M)=3.05×10^{-5} 5 α(N)=6.81×10^{-6} 10; α(O)=1.095×10^{-6} 16; α(P)=8.09×10^{-8} 12
822.1 3	4.9 6	822.00	11/2$^-$	0.0	5/2$^+$	E3		0.00744	α(K)exp=0.0055 17; K/L=7.2 22 α(K)=0.00613 9; α(L)=0.001034 15; α(M)=0.000222 4 α(N)=4.93×10^{-5} 7; α(O)=7.69×10^{-6} 11; α(P)=4.57×10^{-7} 7
827.8 3	29.3 15	828.09	9/2$^+$	0.0	5/2$^+$	E2		0.00322	α(K)exp=0.0023 5; K/L=8.2 19

$^{139}_{59}$Pr$_{80}$-5

γ(^{139}Pr) (continued)

E_γ	I_γ[b]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	δ[†]	α[c]	Comments
									α(K)=0.00274 *4*; α(L)=0.000384 *6*; α(M)=8.11×10^{-5} *12* α(N)=1.81×10^{-5} *3*; α(O)=2.87×10^{-6} *4*; α(P)=1.96×10^{-7} *3*
852.0[d]	≤0.5	851.96	11/2$^+$	0.0	5/2$^+$	[M3]		0.0263	α(K)=0.0220 *3*; α(L)=0.00338 *5*; α(M)=0.000723 *11* α(N)=0.0001618 *23*; α(O)=2.59×10^{-5} *4*; α(P)=1.84×10^{-6} *3*
[x]894.8 *2*	1.00 *16*					(M1)		0.00408	α(K)exp=0.0055 *24* α(K)=0.00351 *5*; α(L)=0.000455 *7*; α(M)=9.53×10^{-5} *14* α(N)=2.13×10^{-5} *3*; α(O)=3.45×10^{-6} *5*; α(P)=2.62×10^{-7} *4*
900.0[ad] *4*	1.10 *20*	1722.0?	15/2$^-$	822.00	11/2$^-$	E2		0.00267	α(K)exp=0.0024 *4* α(K)=0.00228 *4*; α(L)=0.000314 *5*; α(M)=6.63×10^{-5} *10* α(N)=1.476×10^{-5} *21*; α(O)=2.35×10^{-6} *4*; α(P)=1.632×10^{-7} *23* Mult.: (M1) from α_K; E2 from ΔJ^π.
910.1 *3*	21.6 *11*	1023.94	9/2$^+$	113.87	7/2$^+$	E2(+M1)	>1.1	0.0029 *3*	α(K)exp=0.0024 *4*; K/L=8.0 *19* α(K)=0.0025 *3*; α(L)=0.00034 *3*; α(M)=7.1×10^{-5} *7* α(N)=1.58×10^{-5} *14*; α(O)=2.52×10^{-6} *24*; α(P)=1.80×10^{-7} *21*
982.2 *2*	74.8 *22*	1834.06	(9/2$^-$,11/2$^-$)	851.96	11/2$^+$	E1		9.20×10^{-4}	α(K)exp=0.00074 *11*; K/L=8.5 *20* α(K)=0.000794 *12*; α(L)=9.97×10^{-5} *14*; α(M)=2.08×10^{-5} *3* α(N)=4.64×10^{-6} *7*; α(O)=7.48×10^{-7} *11*; α(P)=5.58×10^{-8} *8*
1006.2 *4*	9.1 *7*	1834.06	(9/2$^-$,11/2$^-$)	828.09	9/2$^+$	E1		8.79×10^{-4}	α(K)exp=0.00072 *20* α(K)=0.000759 *11*; α(L)=9.52×10^{-5} *14*; α(M)=1.99×10^{-5} *3* α(N)=4.43×10^{-6} *7*; α(O)=7.14×10^{-7} *10*; α(P)=5.33×10^{-8} *8* Additional information 1.
1012.3 *3*	7.8 *6*	1834.06	(9/2$^-$,11/2$^-$)	822.00	11/2$^-$	E2,M1		0.0026 *5*	α(K)exp=0.0020 *5* α(K)=0.0022 *5*; α(L)=0.00029 *5*; α(M)=6.1×10^{-5} *11* α(N)=1.36×10^{-5} *24*; α(O)=2.2×10^{-6} *4*; α(P)=1.6×10^{-7} *4*
1024.9 *4*	4.3 *3*	2048.64	9/2$^-$,11/2$^-$	1023.94	9/2$^+$	E1		8.49×10^{-4}	α(K)exp=0.00076 *20* α(K)=0.000733 *11*; α(L)=9.19×10^{-5} *13*; α(M)=1.92×10^{-5} *3* α(N)=4.28×10^{-6} *6*; α(O)=6.90×10^{-7} *10*; α(P)=5.15×10^{-8} *8*

$^{139}_{59}$Pr$_{80}$-6

γ(^{139}Pr) (continued)

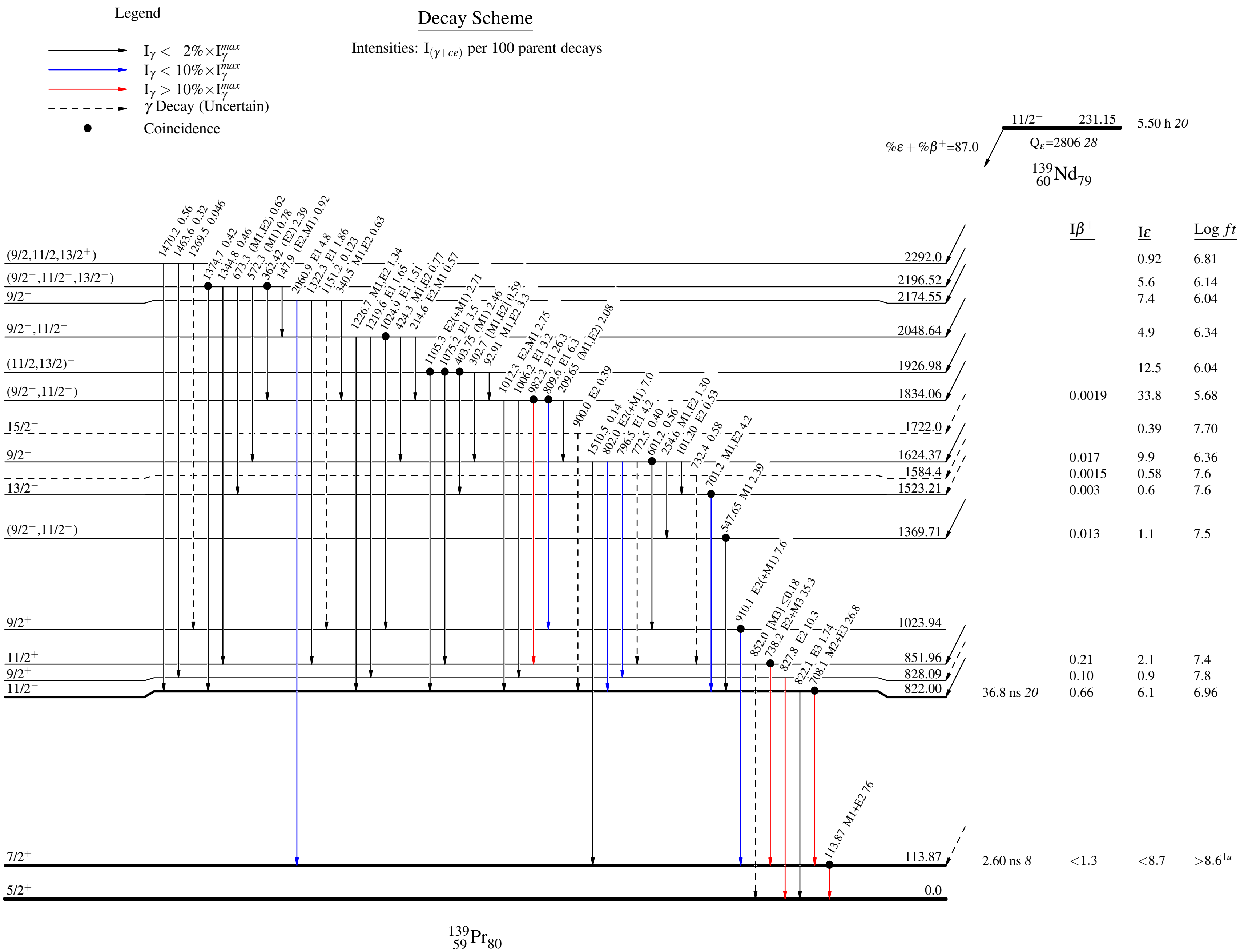
E_γ	I_γ[b]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[†]	δ[†]	α[c]	Comments
1075.2 *3*	9.9 *7*	1926.98	(11/2,13/2)$^-$	851.96	11/2$^+$	E1		7.77×10^{-4}	α(K)exp=0.00060 *15* α(K)=0.000671 *10*; α(L)=8.40×10^{-5} *12*; α(M)=1.751×10^{-5} *25* α(N)=3.91×10^{-6} *6*; α(O)=6.30×10^{-7} *9*; α(P)=4.72×10^{-8} *7*
1105.3 *3*	7.7 *6*	1926.98	(11/2,13/2)$^-$	822.00	11/2$^-$	E2(+M1)	>1.5	0.00184 *12*	α(K)exp=0.0013 *4* α(K)=0.00158 *11*; α(L)=0.000209 *13*; α(M)=4.4×10^{-5} *3* α(N)=9.8×10^{-6} *6*; α(O)=1.57×10^{-6} *10*; α(P)=1.14×10^{-7} *9*; α(IPF)=4.32×10^{-7} *8*
1151.2[@&d] *4*	0.35[@] *7*	2174.55	9/2$^-$	1023.94	9/2$^+$				
[x]1165.8 *5*	0.98 *15*								
1219.6 *4*	4.7 *5*	2048.64	9/2$^-$,11/2$^-$	828.09	9/2$^+$	E1		6.55×10^{-4}	α(K)exp=0.0007 *3* α(K)=0.000534 *8*; α(L)=6.66×10^{-5} *10*; α(M)=1.387×10^{-5} *20* α(N)=3.10×10^{-6} *5*; α(O)=5.00×10^{-7} *7*; α(P)=3.76×10^{-8} *6*; α(IPF)=3.70×10^{-5} *6*
1226.7 *4*	3.8 *4*	2048.64	9/2$^-$,11/2$^-$	822.00	11/2$^-$	M1,E2		0.0017 *3*	α(K)exp=0.0017 *6* α(K)=0.00144 *25*; α(L)=0.00019 *3*; α(M)=3.9×10^{-5} *7* α(N)=8.7×10^{-6} *14*; α(O)=1.41×10^{-6} *23*; α(P)=1.05×10^{-7} *20*; α(IPF)=9.38×10^{-6} *15*
[x]1234.6 *5*	1.2 *2*					M1,E2		0.0017 *3*	α(K)exp=0.0013 *5* α(K)=0.00142 *25*; α(L)=0.00018 *3*; α(M)=3.9×10^{-5} *6* α(N)=8.6×10^{-6} *14*; α(O)=1.39×10^{-6} *23*; α(P)=1.04×10^{-7} *20*; α(IPF)=1.049×10^{-5} *18*
[x]1245.7 *5*	0.82 *18*					E2(+M1)	≥0.5	0.00158 *22*	α(K)exp=0.0011 *5* α(K)=0.00134 *19*; α(L)=0.000175 *23*; α(M)=3.7×10^{-5} *5* α(N)=8.2×10^{-6} *11*; α(O)=1.32×10^{-6} *18*; α(P)=9.8×10^{-8} *15*; α(IPF)=1.210×10^{-5} *20*
1269.5[@&d] *8*	0.13[@] *3*	2292.0	(9/2,11/2,13/2$^+$)	1023.94	9/2$^+$				
1322.3 *3*	5.3 *5*	2174.55	9/2$^-$	851.96	11/2$^+$	E1		6.26×10^{-4}	α(K)exp=0.00041 *18* α(K)=0.000463 *7*; α(L)=5.76×10^{-5} *8*; α(M)=1.200×10^{-5} *17* α(N)=2.68×10^{-6} *4*; α(O)=4.33×10^{-7} *6*; α(P)=3.26×10^{-8} *5*; α(IPF)=9.05×10^{-5} *13*
1344.8 *5*	1.3 *4*	2196.52	(9/2$^-$,11/2$^-$,13/2$^-$)	851.96	11/2$^+$				α(K)exp=0.0007 *5*
[x]1364.8 *5*	0.95 *15*								α(K)exp≈6.9×10^{-4} Coin with 114γ but not placed.

γ(^{139}Pr) (continued)

E_γ	I_γ[b]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[†]	α[c]	Comments
1374.7 *5*	1.2 *4*	2196.52	(9/2⁻,11/2⁻,13/2⁻)	822.00	11/2⁻			
1463.6 *5*	0.9 *3*	2292.0	(9/2,11/2,13/2⁺)	828.09	9/2⁺			
1470.2 *5*	1.6 *4*	2292.0	(9/2,11/2,13/2⁺)	822.00	11/2⁻			
1510.5 *5*	0.40 *15*	1624.37	9/2⁻	113.87	7/2⁺			
[x]1680.7 *5*	0.9 *2*							
2060.9 *3*	13.6 *14*	2174.55	9/2⁻	113.87	7/2⁺	E1	8.86×10^{-4}	α(K)exp=0.00019 *5* α(K)=0.000222 *4*; α(L)=2.74×10^{-5} *4*; α(M)=5.69×10^{-6} *8* α(N)=1.272×10^{-6} *18*; α(O)=2.06×10^{-7} *3*; α(P)=1.571×10^{-8} *22*; α(IPF)=0.000629 *9*
[x]2085.0 *7*	0.15 *6*							
[x]2201.2 *8*	0.36 *7*							

[†] From α(exp)′s and conversion electron ratios, except as noted.
[‡] From α(exp)′s, conversion electron ratios, and γγ(θ) of 1972Kr24.
[#] From γγ(θ) of 1972Kr24.
[@] From 1975Vy02.
[&] Placement suggested by evaluators based on statement by 1975Vy02 that ≈1/2 of the new gammas observed by them could be placed between existing levels.
[a] Placement suggested by evaluators on the basis of reaction γ data.
[b] For absolute intensity per 100 decays, multiply by 0.351 *7*.
[c] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.
[d] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

^{139}Nd ε decay (5.50 h) 1975Vy02,1971Bu22,1969Be64



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