Adopted Levels, Gammas

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

Q(β^-)=−4514 *26*; S(n)=8068 *30*; S(p)=6170 *30*; Q(α)=177 *29* 2012Wa38
S(2n)=18573 *30*, S(2p)=10674 *28* (2012Wa38).
Mass measurement: 2000Be42.

^{139}Nd Levels

Cross Reference (XREF) Flags

A	^{139}Nd IT decay (5.50 h)	F	^{126}Te(^{18}O,5nγ)
B	^{139}Pm ε decay (4.15 min)	G	^{128}Te(^{16}O,5nγ):ciae
C	^{94}Zr(^{48}Ca,3nγ)	H	^{128}Te(^{16}O,5nγ):barc
D	^{96}Zr(^{48}Ca,5nγ):E=180 MeV	I	^{140}Ce(α,5nγ)
E	^{96}Zr(^{48}Ca,5nγ):E=195 MeV		

E(level)[†]	J$^\pi$[‡]	$T_{1/2}$	XREF	Comments
0.0	3/2$^+$	29.7 min *5*	AB DEFGHI	%ε+%β^+=100 μ=+0.907 *7* (1992Le09,2014StZZ) Q=+0.28 *9* (1992Le09,2016St14) RMS charge radius <r^2>$^{1/2}$=4.9076 fm *25* (2013An02 evaluation). J$^\pi$: spin from ABMR (1972Ek04); π from log *ft*=5.2 to 5/2$^+$. $T_{1/2}$: from 1967La19. μ,Q: laser resonance ionization mass spectroscopy (1992Le09, also 1988Al41); Q is Sternheimer corrected.
95.30 *9*	(1/2)$^+$		B	J$^\pi$: M1 γ to 3/2$^+$. 1/2 from syst of odd-mass N=79 isotopes.
231.16[j] *5*	11/2$^-$	5.50 h *20*	A DEFGHI	%ε+%β^+=87.0 *10*; %IT=13.0 *10* J$^\pi$: spin from ABMR (1972Ek04); π from M4 γ to 3/2$^+$. $T_{1/2}$: from 1951St03 (ion chem; β, G-M counter). Others: 5.5 h (1961Bo19), 5.5 h *5* (1963Ko20,1964Gr32). %ε+%β^+,%IT: deduced by evaluators from measured Iγ and I(ceK) of 231γ and Iγ, I(ceK) data of γ rays from ε+β^+ decay to ^{139}Pr. See comments for branching ratio normalization in ^{139}Nd IT decay and in ^{139}Nd ε decay datasets.
402.73 *11*	(3/2,5/2)$^+$		B E	J$^\pi$: M1+E2 γ to 3/2$^+$; β feeding from (5/2)$^+$ parent.
463.09 *12*	(3/2)$^+$		B	J$^\pi$: M1+E2 γ to 3/2$^+$; M1 γ to (1/2)$^+$; β feeding from (5/2)$^+$ parent.
675.45 *18*	(3/2,5/2$^+$)		B	J$^\pi$: γ to (1/2)$^+$; log *ft*=6.9 for feeding from (5/2$^+$) parent.
756.43 *18*	(3/2,5/2$^+$)		B	J$^\pi$: γ to (1/2)$^+$ and log *ft*=6.4 for feeding from (5/2$^+$) parent.
815.65 *17*	(3/2,5/2,7/2$^+$)		B	J$^\pi$: γ to 3/2$^+$; log *ft*=6.7 for feeding from (5/2$^+$) parent.
896.54[j] *10*	15/2$^-$		DEFGHI	J$^\pi$: ΔJ=2, E2 γ to 11/2$^-$.
932.67[e] *16*	(7/2$^-$)		B E	J$^\pi$: ΔJ=1, dipole γ to (3/2,5/2)$^+$; possible bandhead.
981.42 *21*			B	
1066.2 *4*			B	
1098.34 *10*	(13/2)$^-$		DEFGH	J$^\pi$: ΔJ=1, M1 γ to 11/2$^-$.
1105.0 *3*			B	
1282.0 *5*			B	
1319.5 *5*			B	
1343.89 *23*	(13/2$^-$)		G I	
1464.47[e] *19*	(11/2$^-$)		E	
1944.24 *12*	(15/2$^+$)		EFGH	J$^\pi$: π=+ in 2011Bh07. π=(−) suggested in 2007Ku12. ΔJ=2 Q 1713γ to 11/2$^-$ favors negative parity, but note that this γ was not seen in 2011Bh07.
1967.42 *10*	(17/2)$^-$		DEFGHI	

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Adopted Levels, Gammas (continued)

^{139}Nd Levels (continued)

E(level)[†]	Jπ[‡]	$T_{1/2}$	XREF	Comments
1990.74 *11*	(15/2$^+$)		EFGH	Jπ: π=− suggested in 2007Ku12.
2021.41 *17*			B	
2023.28[e] *15*	(15/2$^-$)		E	
2054.03[j] *12*	19/2$^-$		DEFGHI	
2107.51 *14*	(3/2,5/2,7/2)$^+$		B	Jπ: log *ft*=5.7 *1* for feeding from (5/2)$^+$ parent.
2134.8 *5*			I	
2240.54 *20*			B	
2246.94 *11*	(17/2$^-$)		EFGH	Jπ: 2007Ku12 assigned π=− from mult=E1 for 474.6γ from 2721, (19/2$^+$) level in linear polarization measurement. 2008Xu05 also assigned negative parity. 2011Bh07 and 2008Fe02 assigned positive parity. For the 2721 level, all studies assigned 19/2$^+$.
2261.25 *20*			B	
2289.0 *3*			B	
2340.06 *21*			B	
2359.23 *23*			B	
2543.9 *4*	(19/2$^-$)		F H	
2548.18[e] *16*	(19/2$^-$)		E	
2572.33 *11*	(19/2)$^+$		DEFGHI	
2616.9 *6*	(23/2$^+$)	277 ns *2*	D G I	%IT=100 $T_{1/2}$: weighted average of 278 ns *2* (605γ(t),2013Va10) and 272 ns *4* (off-beam 665γ(t) in (α,5nγ)). Other: >141 ns (1977Lu04). Configuration=$\nu h^{-2}_{11/2}\otimes\nu d^{-1}_{3/2}$ (2013Va10).
2617.35 *13*	(17/2$^+$)		EFGH	
2623.43[j] *12*	(21/2)$^-$		DEF HI	
2712.52 *13*	(23/2$^-$)		DEFGH	
2721.54 *11*	(19/2$^+$)		EFGH	
2765.2 *4*			I	
2804.3 *4*	(21/2$^+$)		I	
2843.93[#] *12*	(21/2$^+$)		DEFGH	
2902.13 *18*	(21/2$^-$)		E	
3067.43[#] *13*	(23/2$^+$)		DE GH	
3079.04 *13*	(21/2$^+$)		EF	
3238.10 *18*	(23/2$^+$)		EF H	
3301.06[#] *15*	(25/2$^+$)		DEFGH	
3303.12[e] *18*	(23/2$^-$)		E	
3487.11 *20*	(25/2$^+$)		E	
3496.8 *6*	(27/2$^-$)		F H	
3532.56[#] *18*	(27/2$^+$)		DEFGH	
3825.13 *13*	(25/2$^-$)		DEFGH	
3840.24 *13*	(25/2$^-$)		DEFGH	
3968.56[#] *20*	(29/2$^+$)		DEF H	Reported as 3963.4 keV level in 2008Xu05.
3973.04[e] *15*	(25/2$^-$)		DE	
3980.33[@] *14*	(27/2$^-$)		DEFGH	
3985.15 *20*	(25/2$^-$)		E	
4167.17 *14*	(27/2$^-$)		DEF	
4293.04[@] *15*	(29/2$^-$)		DEF H	
4335.16[#] *20*	(31/2$^+$)		DEF H	
4450.6 *8*	(31/2$^-$)		F H	
4716.46 *16*	(31/2$^-$)		DEF H	
4756.35[@] *18*	(31/2$^-$)		DEF H	
4804.8 *8*	(31/2)		H	
4823.16[#] *25*	(33/2$^+$)		EF H	
4856.16[h] *22*	(33/2$^+$)		EF H	Reported as 4850.5 keV level by 2008Xu05.

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Adopted Levels, Gammas (continued)

^{139}Nd Levels (continued)

E(level)[†]	Jπ[‡]	XREF
4857.1 *9*	(35/2⁻)	F
4913.16[f] *22*	(33/2⁺)	EF H
4937.15[&] *22*	(31/2⁻)	E
4957.76[g] *22*	(35/2⁺)	E
5114.16[#] *23*	(35/2⁺)	E H
5130.9 *6*	(33/2⁻)	F
5222.2 *6*	(37/2⁺)	F
5250.46[h] *24*	(35/2⁺)	E
5289.95[&] *20*	(33/2⁻)	DEF H
5385.16[f] *23*	(35/2⁺)	EF
5392.55[@] *20*	(33/2⁻)	DE H
5441.18[a] *25*	(31/2⁻)	E
5521.2 *3*	(35/2⁺)	EF H
5550.88 *18*	(35/2⁻)	DEF H
5560.2[h] *3*	(37/2⁺)	EF H
5572.71 *22*	(35/2⁻)	E
5612.2[a] *4*	(33/2⁻)	E
5695.55[@] *20*	(35/2⁻)	DE H
5721.1[b] *3*	(35/2⁻)	E
5762.36[g] *24*	(39/2⁺)	E
5777.16[f] *25*	(37/2⁺)	EF
5861.1[b] *4*	(37/2⁻)	E
5873.2[a] *4*	(35/2⁻)	E
5883.9[&] *3*	(35/2⁻)	E
5955.7 *5*	(37/2⁻)	F
6017.1[b] *4*	(39/2⁻)	E
6070.85[@] *23*	(37/2⁻)	DE
6139.06[d] *20*	(37/2⁻)	DEF
6186.4 *5*	(37/2⁻)	F
6211.1[b] *5*	(41/2⁻)	E
6232.9[&] *4*	(37/2⁻)	E
6258.2[f] *3*	(39/2⁺)	E
6267.2[a] *5*	(37/2⁻)	E
6288.2 *3*	(39/2⁺)	EF
6428.41 *20*	(39/2⁻)	EF
6472.1[b] *5*	(43/2⁻)	E
6488.7 *7*	39/2⁻	F
6490.95[@] *25*	(39/2⁻)	DE H
6586.9[&] *4*	(39/2⁻)	E
6673.2[g] *3*	(43/2⁺)	E
6730.2[a] *5*	(39/2⁻)	E
6771.2[h] *4*	(41/2⁺)	EF H
6866.3[b] *6*	(45/2⁻)	E
6932.54[d] *21*	(41/2⁻)	DEF
7003.4[i] *3*	(41/2⁻)	DEF
7018.5 *3*	(41/2⁻)	E
7103.1[c] *3*	(41/2⁻)	E H
7166.2[a] *5*	(41/2⁻)	E

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Adopted Levels, Gammas (continued)

^{139}Nd Levels (continued)

E(level)[†]	Jπ[‡]	XREF	Comments
7341.4[b] 6	(47/2−)	E	
7343.1[c] 3	(43/2−)	E	
7633.1[c] 4	(45/2−)	EF	
7651.1 3	(45/2−)	E	
7702.2[g] 4	(47/2+)	E	
7718.1[i] 3	(45/2−)	DE	
7718.74[d] 23	(45/2−)	EF	
7721.2 4	(47/2+)	E	
8002.1[c] 4	(47/2−)	E	
8074.1 4	(47/2−)	E	
8149.2[g] 4	(49/2+)	E	
8336.1[c] 5	(49/2−)	E	
8361.1[i] 4	(49/2−)	E	
8745.47[d] 24	(49/2−)	DE	
9134.22[k] 24	(49/2−)	E	
9395.1[i] 4	(53/2−)	E	
9717.05[k] 25	(53/2−)	E	
10459.0[k] 3	(57/2−)	E	
10517.1[l] 4	(57/2−)	E	
11089.2[l] 4	(61/2−)	E	
11353.1[k] 3	(61/2−)	E	
11827.2[l] 4	(65/2−)	E	
12414.6[k] 3	(65/2−)	E	
12789.1[l] 4	(69/2−)	E	
13663.4[k] 4	(69/2−)	E	
13975.3[l] 4	(73/2−)	E	
15110.6[k] 4	(73/2−)	E	
15392.2[l] 5	(77/2−)	E	
16741.6[k] 4	(77/2−)	E	
17023.3[l] 5	(81/2−)	E	
18525.6[k] 4	(81/2−)	E	
18839.3[l] 5	(85/2−)	E	
20854.3[l] 6	(89/2−)	E	
x[m]	J1≈(51/2)	E	Additional information 1. Jπ: estimated by 2011Bh07 from the decay out of the band.
794.00+x[m] 10	J1+2	E	
1662.01+x[m] 15	J1+4	E	
2666.01+x[m] 18	J1+6	E	
3849.01+x[m] 20	J1+8	E	
5191.0+x[m] 3	J1+10	E	
6650.0+x[m] 4	J1+12	E	
8228.0+x[m] 4	J1+14	E	
9953.1+x[m] 5	J1+16	E	
11828.1+x[m] 5	(J1+18)	E	
y[n]	J2≈(49/2,53/2)	C	Additional information 2. E(level),Jπ: this level decays through a ΔJ=1, 388γ to the (47/2) level of a band similar to Band #3 and #4 in ^{137}Nd (See 1997Pe06). J=49/2 assigned by 2000Pe01. A spin value larger by 2 may be possible if there are possible unobserved transitions.
583.0+y[n] 10		C	

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Adopted Levels, Gammas (continued)

^{139}Nd Levels (continued)

E(level)[†]	Jπ[‡]	XREF	Comments
1325.0+y[n] *15*		C	
2219.0+y[n] *18*		C	
3281.0+y[n] *20*		C	
4530.0+y[n] *23*		C	
5977.0+y[n] *25*		C	
z[o]	J3≥(49/2)	C	Additional information 3. E(level): this level decays through a 1122γ-1033γ cascade of ΔJ=2, E2 transitions to a dipole band, similar to Band #7 in ^{137}Nd (See 1997Pe06).
572.0+z[o] *10*		C	
1310.0+z[o] *15*		C	
2273.0+z[o] *18*		C	
3460.0+z[o] *20*		C	
4877.0+z[o] *23*		C	
6508.0+z[o] *25*		C	

[†] From least-squares fit to Eγ data. Note that ordering of some of the γ-ray cascades is different in various in-beam γ-ray studies. The evaluators adopt the orderings from 2011Bh07 which is the most detailed study so far, and with the best statistics. The level matching in various datasets has been done from the observation of the matching γ cascades, consequently, actual level energies in some of the datasets are different from the ones given in the present dataset.

[‡] For high-spin (J≥11/2) states, the assignments are essentially based on γγ(θ)(DCO) data, linear polarization data for a few transitions, and band associations. These are mostly from 2011Bh07 with parentheses added by the evaluators, as strong arguments, in general, seem lacking.

[#] Band(A): ΔJ=1 band based on (21/2$^+$) Parity from 2013Va10, it is given as positive in 2011Bh07.

[@] Band(B): ΔJ=1 band based on 27/2$^-$.

[&] Band(C): ΔJ=1 band based on 31/2$^-$.

[a] Band(D): ΔJ=1 band based on 31/2$^-$.

[b] Band(E): ΔJ=1 band based on 35/2$^-$.

[c] Band(F): ΔJ=1 band based on 41/2$^-$.

[d] Band(G): ΔJ=2 band based on 37/2$^-$.

[e] Band(H): Band based on 7/2$^-$.

[f] Band(I): ΔJ=1 band based on 33/2$^+$.

[g] Band(J): Band based on 35/2$^+$.

[h] Band(K): Band based on 33/2$^+$.

[i] Band(L): ΔJ=2 γ cascade based on 41/2$^-$.

[j] Band(M): γ cascade based on 11/2$^-$.

[k] Band(N): ΔJ=2 band based on 49/2$^-$. The floating ΔJ=2 band based on 11/2$^-$ may be signature partner of ΔJ=2 band.

[l] Band(O): ΔJ=2 band based on 57/2$^-$.

[m] Band(P): ΔJ=2 band.

[n] Band(Q): Triaxial band #1. Population intensity=15% *5*.

[o] Band(R): Triaxial band #2. Population intensity=15% *5*.

Adopted Levels, Gammas (continued)

$\gamma(^{139}Nd)$

Information for 231γ is from IT decay. Other data are from ε decay or (^{16}O,5nγ), (^{3}He,4nγ), and (α,5nγ) as indicated in the cross-reference column of the Adopted Levels. See ε decay and (^{16}O,5nγ), (^{3}He,4nγ), and (α,5nγ) for unplaced gammas.

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	δ[#]	α[@]	Comments
95.30	$(1/2)^+$	95.3 *1*	100	0.0	$3/2^+$	M1(+E2)	<0.18	1.64 *3*	α(K)=1.382 *20*; α(L)=0.204 *13*; α(M)=0.044 *3*; α(N)=0.0097 *6*; α(O)=0.00146 *8* α(P)=8.91×10^{-5} *14*
231.16	$11/2^-$	231.15 *5*	100	0.0	$3/2^+$	M4		14.51	α(K)=9.38 *14*; α(L)=3.95 *6*; α(M)=0.943 *14*; α(N)=0.211 *3*; α(O)=0.0293 *5*; α(P)=0.001179 *17* B(M4)(W.u.)=2.7 *3*
402.73	$(3/2,5/2)^+$	307.4 *2*	2.4 *3*	95.30	$(1/2)^+$	[E2]		0.0485	α(K)=0.0385 *6*; α(L)=0.00786 *12*; α(M)=0.001719 *25*; α(N)=0.000378 *6*; α(O)=5.33×10^{-5} *8* α(P)=2.12×10^{-6} *3*
		402.8 *2*	100	0.0	$3/2^+$	M1+E2	1.0 *5*	0.027 *3*	α(K)=0.022 *3*; α(L)=0.00339 *17*; α(M)=0.00072 *3* α(N)=0.000161 *8*; α(O)=2.39×10^{-5} *15*; α(P)=1.4×10^{-6} *2*
463.09	$(3/2)^+$	367.8 *2*	86 *6*	95.30	$(1/2)^+$	M1		0.0401	α(K)=0.0342 *5*; α(L)=0.00462 *7*; α(M)=0.000978 *14*; α(N)=0.000219 *3*; α(O)=3.34×10^{-5} *5* α(P)=2.19×10^{-6} *3*
		463.1 *2*	100 *7*	0.0	$3/2^+$	M1+E2	>0.045	0.018 *4*	α(K)=0.015 *4*; α(L)=0.0023 *3*; α(M)=0.00049 *6*; α(N)=0.000108 *13*; α(O)=1.62×10^{-5} *22* α(P)=1.0×10^{-6} *3*
675.45	$(3/2,5/2^+)$	272.7 *4*	28 *7*	402.73	$(3/2,5/2)^+$				
		580.1 *3*	100 *11*	95.30	$(1/2)^+$				
		675.5 *3*	45 *4*	0.0	$3/2^+$				
756.43	$(3/2,5/2^+)$	661.3 *4*	20.4 *22*	95.30	$(1/2)^+$				
		756.5 *3*	100 *8*	0.0	$3/2^+$				
815.65	$(3/2,5/2,7/2^+)$	412.5 *10*	13 *7*	402.73	$(3/2,5/2)^+$				
		815.8 *2*	100 *8*	0.0	$3/2^+$				
896.54	$15/2^-$	665.4 *1*	100	231.16	$11/2^-$	E2			
932.67	$(7/2^-)$	530.0 *2*	100	402.73	$(3/2,5/2)^+$	D			
981.42		579.0 *6*	5.3 *14*	402.73	$(3/2,5/2)^+$				
		981.6 *4*	100 *7*	0.0	$3/2^+$				
1066.2		603.1 *4*	100 *10*	463.09	$(3/2)^+$				
		663.4 *6*	81 *16*	402.73	$(3/2,5/2)^+$				
1098.34	$(13/2)^-$	867.2 *1*	100	231.16	$11/2^-$	M1			
1105.0		702.0 *10*	100 *26*	402.73	$(3/2,5/2)^+$				
		1105.0 *3*	49 *11*	0.0	$3/2^+$				
1282.0		822.0[&] *10*	105 *50*	463.09	$(3/2)^+$				
		879.3 *4*	100 *15*	402.73	$(3/2,5/2)^+$				
1319.5		856.4 *4*	100	463.09	$(3/2)^+$				
1343.89	$(13/2^-)$	1112.1 *3*	100	231.16	$11/2^-$	D+Q			

Adopted Levels, Gammas (continued)

γ(^{139}Nd) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	Comments
1464.47	(11/2$^-$)	532.0 *2*	100	932.67	(7/2$^-$)	Q	
1944.24	(15/2$^+$)	845.9 *1*	100 *11*	1098.34	(13/2)$^-$	D	
		1047.7 *2*	17 *3*	896.54	15/2$^-$	D	
		1713.2[&] *5*	47 *8*	231.16	11/2$^-$	Q	γ not in 2011Bh07, treated as uncertain by evaluators.
1967.42	(17/2)$^-$	622.9 *3*	11.3 *17*	1343.89	(13/2$^-$)		γ not in 2011Bh07.
		869.1 *1*	11 *1*	1098.34	(13/2)$^-$	Q	
		1070.9 *1*	100 *10*	896.54	15/2$^-$	M1	
1990.74	(15/2$^+$)	892.4 *1*	100	1098.34	(13/2)$^-$	D	
2021.41		1205.7 *4*	26 *6*	815.65	(3/2,5/2,7/2$^+$)		
		1265.1 *3*	44 *7*	756.43	(3/2,5/2$^+$)		
		1558.2 *5*	64 *10*	463.09	(3/2)$^+$		
		1618.7 *3*	100 *79*	402.73	(3/2,5/2)$^+$		
		2021.3 *3*	86 *7*	0.0	3/2$^+$		
2023.28	(15/2$^-$)	559.0 *2*	100 *20*	1464.47	(11/2$^-$)	Q	
		1792.0 *2*		231.16	11/2$^-$		
2054.03	19/2$^-$	86.4 *5*	8 *2*	1967.42	(17/2)$^-$	D	γ not in 2011Bh07.
		1157.5 *1*	100 *10*	896.54	15/2$^-$	E2	
2107.51	(3/2,5/2,7/2)$^+$	1126.1 *3*	40 *4*	981.42			
		1174.7 *3*	24.5 *21*	932.67	(7/2$^-$)		
		1292.5 *4*	39 *4*	815.65	(3/2,5/2,7/2$^+$)		
		1351.1 *3*	29 *3*	756.43	(3/2,5/2$^+$)		
		1644.5 *3*	43 *4*	463.09	(3/2)$^+$		
		1704.6 *3*	100 *10*	402.73	(3/2,5/2)$^+$		
		2107.3 *3*	51 *6*	0.0	3/2$^+$		
2134.8		1238.2[&] *4*	100	896.54	15/2$^-$		
2240.54		1484.1 *1*	100	756.43	(3/2,5/2$^+$)		
2246.94	(17/2$^-$)	256.2 *1*	100 *10*	1990.74	(15/2$^+$)	D	
		302.7 *1*	60 *6*	1944.24	(15/2$^+$)	D	
		1350.4 *2*	7.1 *12*	896.54	15/2$^-$	D+Q	
2261.25		1798.4 *4*	36 *5*	463.09	(3/2)$^+$		
		1858.5 *3*	100 *12*	402.73	(3/2,5/2)$^+$		
		2261.1 *3*	88 *12*	0.0	3/2$^+$		
2289.0		1473.0 *10*	84 *29*	815.65	(3/2,5/2,7/2$^+$)		
		1825.9 *3*	100 *16*	463.09	(3/2)$^+$		
		1886.2 *5*	94 *16*	402.73	(3/2,5/2)$^+$		
2340.06		1358.8 *3*	33 *11*	981.42			
		1664.6 *3*	24 *4*	675.45	(3/2,5/2$^+$)		
		1876.8 *3*	100 *18*	463.09	(3/2)$^+$		
2359.23		1426.3 *4*	58 *14*	932.67	(7/2$^-$)		
		1956.7 *6*	90 *18*	402.73	(3/2,5/2)$^+$		
		2359.3 *3*	100 *9*	0.0	3/2$^+$		
2543.9	(19/2$^-$)	1646.6 *5*	100	896.54	15/2$^-$	Q	
2548.18	(19/2$^-$)	525.0 *2*	100 *23*	2023.28	(15/2$^-$)	Q	

Adopted Levels, Gammas (continued)

γ(^{139}Nd) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	Comments
2548.18	(19/2$^-$)	1651.6 *2*		896.54	15/2$^-$		
2572.33	(19/2)$^+$	325.4 *1*	16.0 *16*	2246.94	(17/2$^-$)	D	
		581.6 *1*	15.1 *15*	1990.74	(15/2$^+$)	Q	
		604.9 *1*	100 *10*	1967.42	(17/2)$^-$	E1	
2616.9	(23/2$^+$)	(45)		2572.33	(19/2)$^+$		
2617.35	(17/2$^+$)	1720.8 *1*	100	896.54	15/2$^-$	D+Q	
2623.43	(21/2)$^-$	569.4 *1*	100 *10*	2054.03	19/2$^-$	M1	
		656.0 *1*	20 *2*	1967.42	(17/2)$^-$	Q	
2712.52	(23/2$^-$)	89.1 *1*	100 *10*	2623.43	(21/2)$^-$	D	
		167.9 *5*	25 *4*	2543.9	(19/2$^-$)	(E2)	Transition not seen in 2011Bh07.
		658.5 *5*	53 *5*	2054.03	19/2$^-$	Q	
2721.54	(19/2$^+$)	104.2 *2*	13.5 *14*	2617.35	(17/2$^+$)	D	
		149.2 *1*	38 *4*	2572.33	(19/2)$^+$	D	Mult.: ΔJ=0 transition.
		474.6 *1*	100 *10*	2246.94	(17/2$^-$)	E1	
		730.8 *1*	19 *2*	1990.74	(15/2$^+$)	Q	
2765.2		192.9[&] *3*	100	2572.33	(19/2)$^+$		
2804.3	(21/2$^+$)	232.0 *3*	100	2572.33	(19/2)$^+$	D	
2843.93	(21/2$^+$)	122.4 *1*	35 *3*	2721.54	(19/2$^+$)	D	
		271.6 *1*	100 *10*	2572.33	(19/2)$^+$	D	
		597.0 *2*	9.3 *20*	2246.94	(17/2$^-$)	Q	
2902.13	(21/2$^-$)	58.2 *2*	100	2843.93	(21/2$^+$)	D	
3067.43	(23/2$^+$)	223.5 *1*	100	2843.93	(21/2$^+$)	D	
3079.04	(21/2$^+$)	357.5 *1*	56 *6*	2721.54	(19/2$^+$)	D	
		1025.0 *1*	100 *10*	2054.03	19/2$^-$	D	
3238.10	(23/2$^+$)	159.1 *5*	100	3079.04	(21/2$^+$)	D	
3301.06	(25/2$^+$)	233.6 *1*	100	3067.43	(23/2$^+$)	D	
3303.12	(23/2$^-$)	755.0 *2*	100	2548.18	(19/2$^-$)	Q	
3487.11	(25/2$^+$)	249.0 *2*	100	3238.10	(23/2$^+$)	D	
3496.8	(27/2$^-$)	784.3 *5*	100	2712.52	(23/2$^-$)	E2	
3532.56	(27/2$^+$)	231.5 *1*	100	3301.06	(25/2$^+$)	D	
3825.13	(25/2$^-$)	1112.6 *1*	100 *10*	2712.52	(23/2$^-$)	(M1)	
		1201.7 *1*	13.0 *13*	2623.43	(21/2)$^-$	Q	
		1208		2616.9	(23/2$^+$)		γ from 2013Va10; not in 2011Bh07.
3840.24	(25/2$^-$)	602.1 *2*	12.7 *13*	3238.10	(23/2$^+$)	D	
		772.8 *1*	15.6 *17*	3067.43	(23/2$^+$)	D	762.7γ in 2007Ku12 not seen in 2011Bh07.
		938.1 *2*	8.6 *9*	2902.13	(21/2$^-$)	Q	
		1127.7 *1*	100 *10*	2712.52	(23/2$^-$)	M1	
		1216.8 *1*	29 *3*	2623.43	(21/2)$^-$	Q	
		1224		2616.9	(23/2$^+$)		γ not in 2011Bh07.
3968.56	(29/2$^+$)	436.0 *1*	100	3532.56	(27/2$^+$)	M1	
3973.04	(25/2$^-$)	670.0 *2*	100 *20*	3303.12	(23/2$^-$)	D	
		735.0 *2*		3238.10	(23/2$^+$)		
		905.7 *2*		3067.43	(23/2$^+$)	D	

Adopted Levels, Gammas (continued)

γ(^{139}Nd) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	α[@]	Comments
3973.04	(25/2⁻)	1356		2616.9	(23/2⁺)			γ not in 2011Bh07.
3980.33	(27/2⁻)	140.1 *1*	100 *10*	3840.24	(25/2⁻)	D		
		155.2 *1*	35 *3*	3825.13	(25/2⁻)	D		
		493.2 *2*		3487.11	(25/2⁺)			
		679.2 *2*	11.4 *22*	3301.06	(25/2⁺)	D		
3985.15	(25/2⁻)	682.0 *2*	100	3303.12	(23/2⁻)			
4167.17	(27/2⁻)	182.0 *2*	3.7 *7*	3985.15	(25/2⁻)	D		
		194.2 *1*	100 *10*	3973.04	(25/2⁻)	D		
		326.9 *1*	68 *7*	3840.24	(25/2⁻)	M1	0.0545	α(K)=0.0465 *7*; α(L)=0.00630 *9*; α(M)=0.001334 *19*; α(N)=0.000299 *5*; α(O)=4.55×10^{-5} *7* α(P)=2.98×10^{-6} *5*
		866.1 *2*	5.4 *11*	3301.06	(25/2⁺)	D		
4293.04	(29/2⁻)	312.7 *1*	100	3980.33	(27/2⁻)	M1		
4335.16	(31/2⁺)	366.6 *1*	100 *10*	3968.56	(29/2⁺)	M1		
		802.6 *1*	64 *6*	3532.56	(27/2⁺)	E2		
4450.6	(31/2⁻)	953.8 *5*	100	3496.8	(27/2⁻)	Q		
4716.46	(31/2⁻)	423.4 *1*	52 *5*	4293.04	(29/2⁻)	D		
		549.3 *1*	100 *10*	4167.17	(27/2⁻)	Q		
4756.35	(31/2⁻)	463.3 *1*	100	4293.04	(29/2⁻)	M1		
4804.8	(31/2)	1308.0 *5*	100	3496.8	(27/2⁻)			
4823.16	(33/2⁺)	854.6 *2*	100	3968.56	(29/2⁺)	Q		
4856.16	(33/2⁺)	521.0 *1*	100 *10*	4335.16	(31/2⁺)	M1		
		887.6 *2*	11.2 *11*	3968.56	(29/2⁺)	Q		
4857.1	(35/2⁻)	406.5 *5*	100	4450.6	(31/2⁻)	Q		
4913.16	(33/2⁺)	578.0 *1*	100	4335.16	(31/2⁺)	M1		
4937.15	(31/2⁻)	644.1 *2*	100	4293.04	(29/2⁻)	D		
4957.76	(35/2⁺)	622.6 *1*	100	4335.16	(31/2⁺)	Q		
5114.16	(35/2⁺)	291.0 *2*	100 *10*	4823.16	(33/2⁺)	D		
		779.0 *2*	63 *6*	4335.16	(31/2⁺)	Q		
5130.9	(33/2⁻)	374.6 *5*	100	4756.35	(31/2⁻)	D+Q		
5222.2	(37/2⁺)	309.0 *5*	100	4913.16	(33/2⁺)	Q		
5250.46	(35/2⁺)	394.3 *1*	100	4856.16	(33/2⁺)	D		
5289.95	(33/2⁻)	352.8 *2*	15.8 *16*	4937.15	(31/2⁻)	D		
		533.6 *1*	100 *10*	4756.35	(31/2⁻)	(M1)		
5385.16	(35/2⁺)	271.0 *1*	100 *10*	5114.16	(35/2⁺)	D		
		472.0 *1*	99 *10*	4913.16	(33/2⁺)	D		
5392.55	(33/2⁻)	636.2 *1*	100	4756.35	(31/2⁻)	M1		
5441.18	(31/2⁻)	1274.0 *2*	100	4167.17	(27/2⁻)	Q		
5521.2	(35/2⁺)	1186.0 *2*	100	4335.16	(31/2⁺)	Q		
5550.88	(35/2⁻)	834.4 *1*	100	4716.46	(31/2⁻)	Q		
5560.2	(37/2⁺)	309.7 *1*	100	5250.46	(35/2⁺)	D		
5572.71	(35/2⁻)	856.3 *2*	100	4716.46	(31/2⁻)	Q		
5612.2	(33/2⁻)	171.0 *2*	100	5441.18	(31/2⁻)	D		

Adopted Levels, Gammas (continued)

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

E_i(level)	J_i^π	E_γ†	I_γ†	E_f	J_f^π	Mult.‡
5695.55	(35/2−)	303.0 1	100 10	5392.55	(33/2−)	D
		405.6 1	53 5	5289.95	(33/2−)	M1
5721.1	(35/2−)	964.8 2	100	4756.35	(31/2−)	Q
5762.36	(39/2+)	804.6 1	100	4957.76	(35/2+)	Q
5777.16	(37/2+)	392.0 1	100	5385.16	(35/2+)	D
5861.1	(37/2−)	140.0 2	100	5721.1	(35/2−)	D
5873.2	(35/2−)	261.0 2	100	5612.2	(33/2−)	D
5883.9	(35/2−)	594.0 2	100	5289.95	(33/2−)	D
5955.7	(37/2−)	404.8 5	100	5550.88	(35/2−)	D+Q
6017.1	(39/2−)	156.0 2	100	5861.1	(37/2−)	D
6070.85	(37/2−)	375.3 1	100	5695.55	(35/2−)	D
6139.06	(37/2−)	566.4 2	11.7 12	5572.71	(35/2−)	D
		588.3 1	100 10	5550.88	(35/2−)	D
6186.4	(37/2−)	635.5 5	100	5550.88	(35/2−)	D+Q
6211.1	(41/2−)	194.0 2	100	6017.1	(39/2−)	
6232.9	(37/2−)	349.0 2	100	5883.9	(35/2−)	D
6258.2	(39/2+)	481.0 1	100	5777.16	(37/2+)	D
6267.2	(37/2−)	394.0 2	100	5873.2	(35/2−)	D
6288.2	(39/2+)	511.0 1	100	5777.16	(37/2+)	D
6428.41	(39/2−)	877.4 1	100	5550.88	(35/2−)	Q
6472.1	(43/2−)	261.0 2		6211.1	(41/2−)	
6488.7	39/2−	302.3	100 10	6186.4	(37/2−)	D+Q
		533.0 5	31 16	5955.7	(37/2−)	D+Q
6490.95	(39/2−)	420.1 1	100	6070.85	(37/2−)	D
6586.9	(39/2−)	354.0 2	100	6232.9	(37/2−)	
6673.2	(43/2+)	910.8 1	100	5762.36	(39/2+)	Q
6730.2	(39/2−)	463.0 1	100	6267.2	(37/2−)	D
6771.2	(41/2+)	1211.0 2	100	5560.2	(37/2+)	Q
6866.3	(45/2−)	394.1 2	100	6472.1	(43/2−)	
6932.54	(41/2−)	504.0 1	35 4	6428.41	(39/2−)	D
		793.6 1	100 10	6139.06	(37/2−)	Q
7003.4	(41/2−)	512.4 1	100	6490.95	(39/2−)	D
7018.5	(41/2−)	527.6 1	100	6490.95	(39/2−)	D
7103.1	(41/2−)	612.2 2	100	6490.95	(39/2−)	D
7166.2	(41/2−)	436.0 2	100	6730.2	(39/2−)	D
7341.4	(47/2−)	475.1 2	100	6866.3	(45/2−)	D
7343.1	(43/2−)	240.0 2	100 20	7103.1	(41/2−)	D
		339.7 2	42 10	7003.4	(41/2−)	D
7633.1	(45/2−)	290.0 1	100	7343.1	(43/2−)	D
7651.1	(45/2−)	632.6 2	100 20	7018.5	(41/2−)	Q
		647.8 2	80 20	7003.4	(41/2−)	Q
7702.2	(47/2+)	1029.0 2	100	6673.2	(43/2+)	Q
7718.1	(45/2−)	714.7 2	100	7003.4	(41/2−)	Q

$^{139}_{60}Nd_{79}$-10

Adopted Levels, Gammas (continued)

γ(^{139}Nd) (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	Mult. ‡	Comments
7718.74	(45/2$^-$)	786.2 *1*	100	6932.54	(41/2$^-$)	Q	
7721.2	(47/2$^+$)	1048.0 *2*	100	6673.2	(43/2$^+$)	Q	
8002.1	(47/2$^-$)	369.0 *2*	100	7633.1	(45/2$^-$)	D	
8074.1	(47/2$^-$)	441.0 *2*	100	7633.1	(45/2$^-$)	D	
8149.2	(49/2$^+$)	428.0 *2*	48 *9*	7721.2	(47/2$^+$)	D	
		447.0 *2*	100 *22*	7702.2	(47/2$^+$)	D	
8336.1	(49/2$^-$)	334.0 *2*	100	8002.1	(47/2$^-$)	D	
8361.1	(49/2$^-$)	643.0 *2*	80 *20*	7718.1	(45/2$^-$)	Q	
		710.0 *2*	100 *20*	7651.1	(45/2$^-$)	Q	
8745.47	(49/2$^-$)	1026.4 *1*	100	7718.74	(45/2$^-$)	Q	Additional information 4.
9134.22	(49/2$^-$)	388.6 *1*	100 *10*	8745.47	(49/2$^-$)	D	
		1415.8 *1*	85 *9*	7718.74	(45/2$^-$)	Q	Additional information 5.
9395.1	(53/2$^-$)	1034.0 *1*	100	8361.1	(49/2$^-$)	Q	
9717.05	(53/2$^-$)	583.0 *1*	100 *10*	9134.22	(49/2$^-$)	Q	
		971.4 *1*	42 *4*	8745.47	(49/2$^-$)	Q	
10459.0	(57/2$^-$)	742.0 *1*	100	9717.05	(53/2$^-$)	Q	
10517.1	(57/2$^-$)	1122.0 *1*	100	9395.1	(53/2$^-$)	Q	
11089.2	(61/2$^-$)	572.1 *1*	100	10517.1	(57/2$^-$)	Q	
11353.1	(61/2$^-$)	894.0 *1*	100	10459.0	(57/2$^-$)	Q	
11827.2	(65/2$^-$)	738.0 *1*	100	11089.2	(61/2$^-$)	Q	
12414.6	(65/2$^-$)	1061.5 *1*	100	11353.1	(61/2$^-$)	Q	
12789.1	(69/2$^-$)	961.9 *1*	100	11827.2	(65/2$^-$)	Q	
13663.4	(69/2$^-$)	1248.8 *1*	100	12414.6	(65/2$^-$)	Q	
13975.3	(73/2$^-$)	1186.2 *1*	100	12789.1	(69/2$^-$)	Q	
15110.6	(73/2$^-$)	1447.2 *1*	100	13663.4	(69/2$^-$)	Q	
15392.2	(77/2$^-$)	1416.9 *1*	100	13975.3	(73/2$^-$)	Q	
16741.6	(77/2$^-$)	1631.0 *1*	100	15110.6	(73/2$^-$)	Q	
17023.3	(81/2$^-$)	1631.0 *2*	100	15392.2	(77/2$^-$)	Q	
18525.6	(81/2$^-$)	1784.0 *2*	100	16741.6	(77/2$^-$)	Q	
18839.3	(85/2$^-$)	1816.0 *2*	100	17023.3	(81/2$^-$)	Q	
20854.3	(89/2$^-$)	2015.0 *2*	100	18839.3	(85/2$^-$)		
794.00+x	J1+2	794.0 *1*	100	x	J1≈(51/2)	Q	
1662.01+x	J1+4	868.0 *1*	100	794.00+x	J1+2	Q	
2666.01+x	J1+6	1004.0 *1*	100	1662.01+x	J1+4	Q	
3849.01+x	J1+8	1183.0 *1*	100	2666.01+x	J1+6	Q	
5191.0+x	J1+10	1342.0 *2*	100	3849.01+x	J1+8	Q	
6650.0+x	J1+12	1459.0 *2*	100	5191.0+x	J1+10	Q	
8228.0+x	J1+14	1578.0 *2*	100	6650.0+x	J1+12	Q	
9953.1+x	J1+16	1725.0 *2*	100	8228.0+x	J1+14	Q	
11828.1+x	(J1+18)	1875.0 *2*	100	9953.1+x	J1+16		
583.0+y		583	100	y	J2≈(49/2,53/2)		
1325.0+y		742	100	583.0+y			
2219.0+y		894	100	1325.0+y			

$^{139}_{60}Nd_{79}$-11

Adopted Levels, Gammas (continued)

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

E_i(level)	E_γ †	I_γ †	E_f	J^π_f	E_i(level)	E_γ †	I_γ †	E_f
3281.0+y	1062	100	2219.0+y		2273.0+z	963	100	1310.0+z
4530.0+y	1249	100	3281.0+y		3460.0+z	1187	100	2273.0+z
5977.0+y	1447	100	4530.0+y		4877.0+z	1417	100	3460.0+z
572.0+z	572	100	z	J3≥(49/2)	6508.0+z	1631	100	4877.0+z
1310.0+z	738	100	572.0+z					

† For low-spin (J<11/2) states, data are from ε decay. For high-spin (J≥11/2), most data are from ^{96}Zr(^{48}Ca,5nγ):E=195 MeV (2011Bh07), which are the most detailed and comprehensive. Exceptions are noted.

‡ From ce data in ε decay for low-spin states. For high-spin states (J≥11/2), assignments are from $\gamma\gamma(\theta)$(DCO) and angular distribution asymmetries, mainly from 2011Bh07 in ^{96}Zr(^{48}Ca,5nγ):E=195 MeV. The E2, M1 and E1 assignments for high-spin levels are from the linear polarization data for selected transitions in ^{126}Te(^{18}O,5nγ): 2007Ku12. Mult=Q indicates ΔJ=2, quadrupole (most likely E2) and mult=D or D+Q indicates ΔJ=1, dipole or dipole with some quadrupole admixture.

From ce data in ε decay.

@ 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.

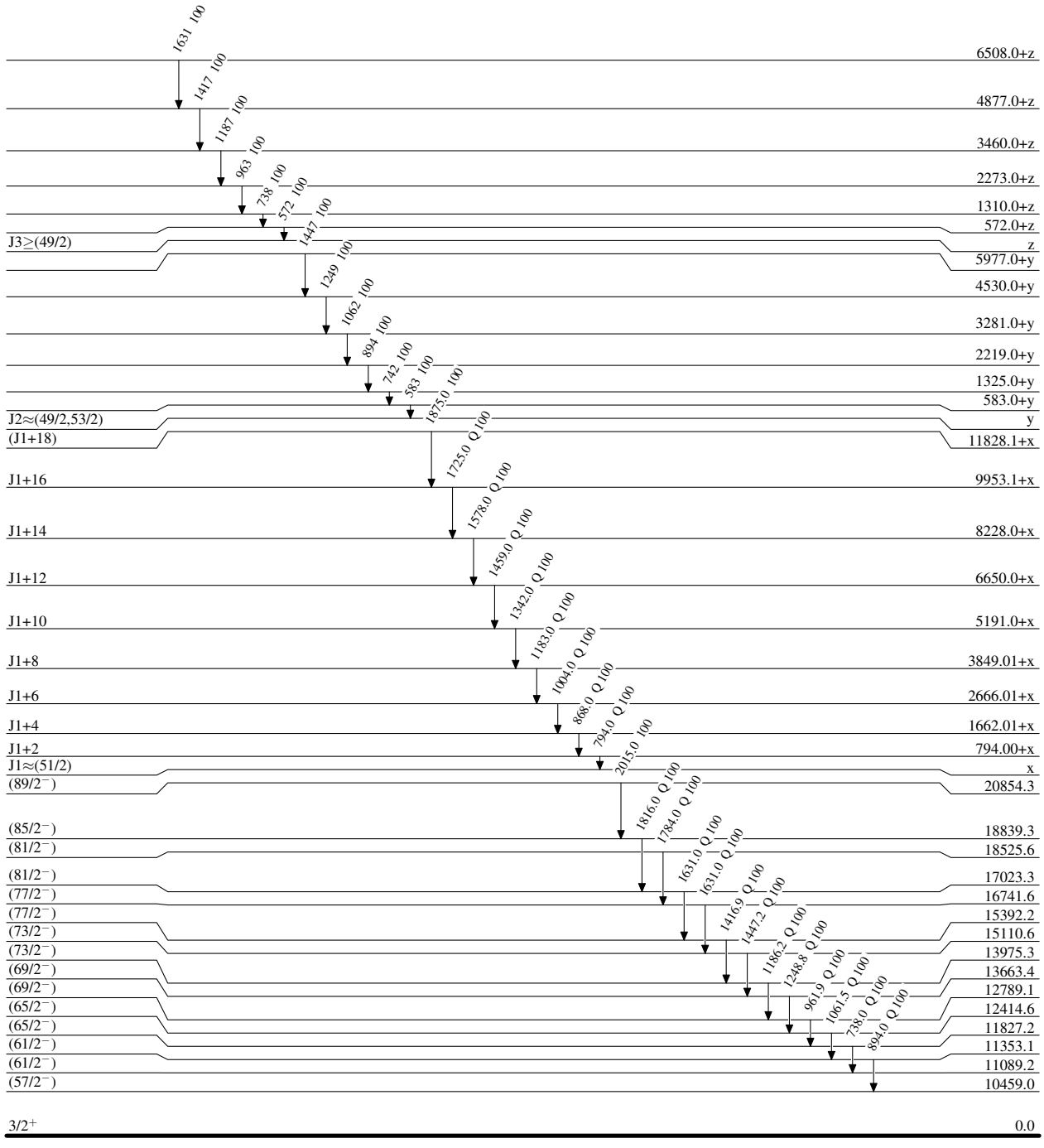
& Placement of transition in the level scheme is uncertain.

$^{139}_{60}Nd_{79}$-12

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level

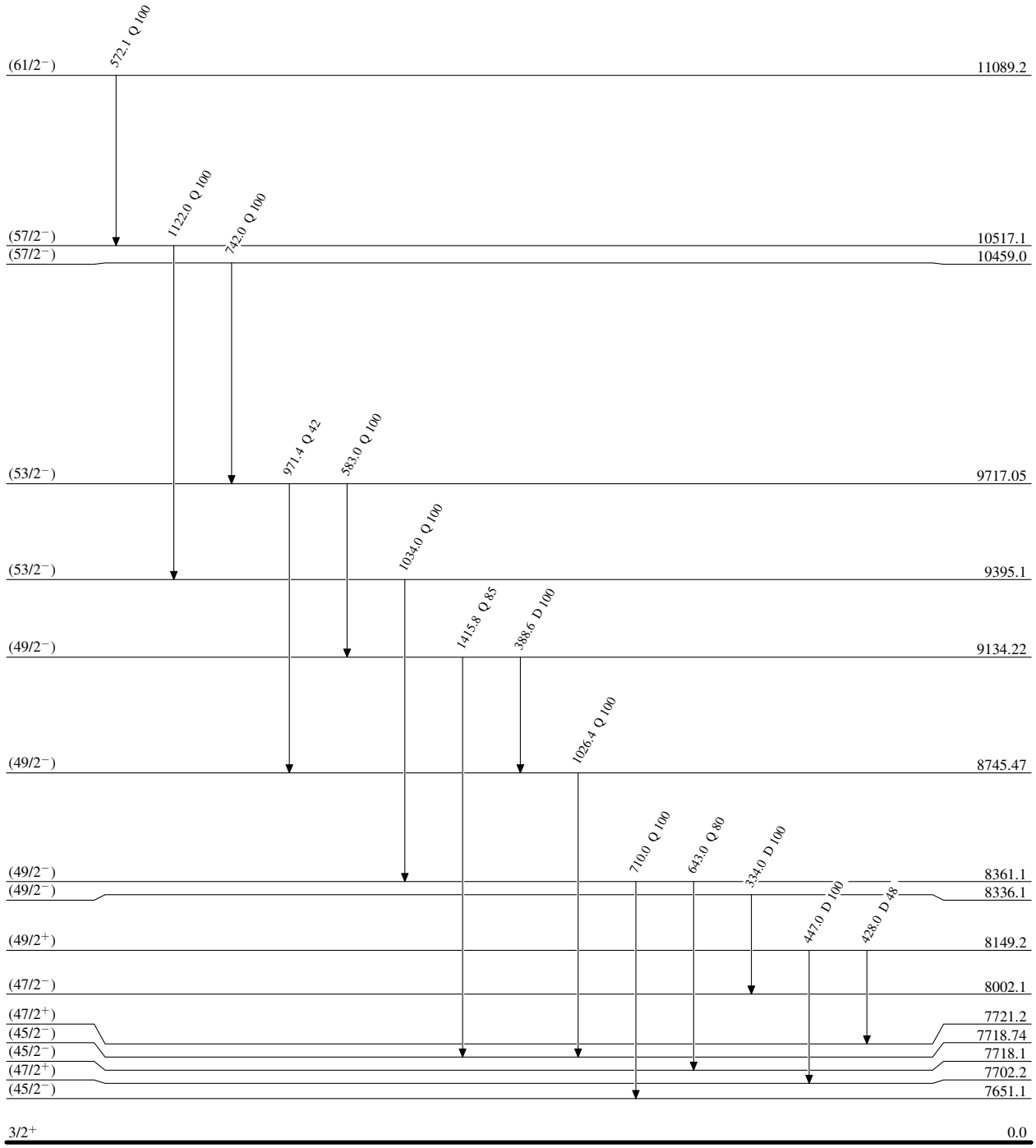


$^{139}_{60}Nd_{79}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

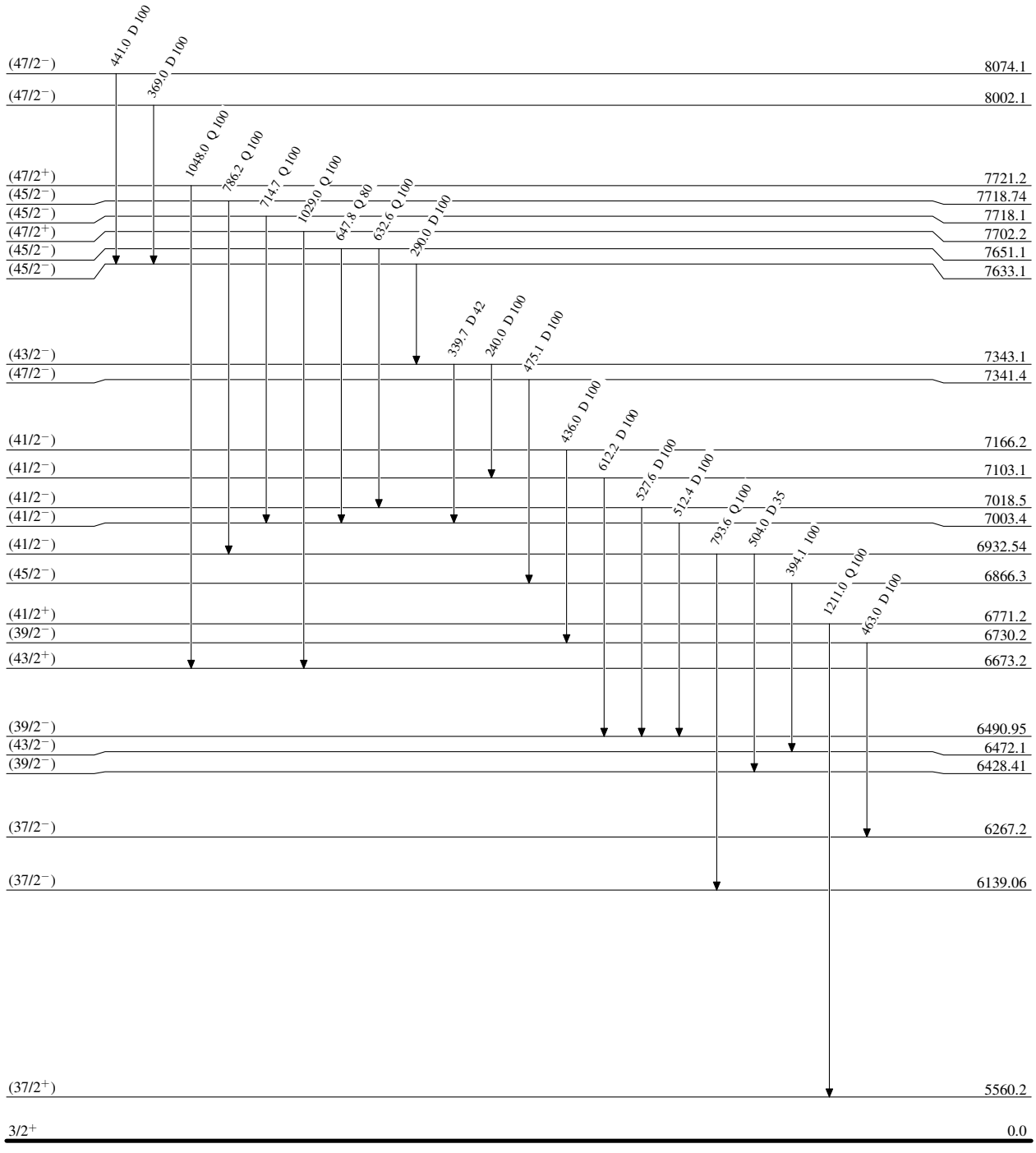


$^{139}_{60}Nd_{79}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

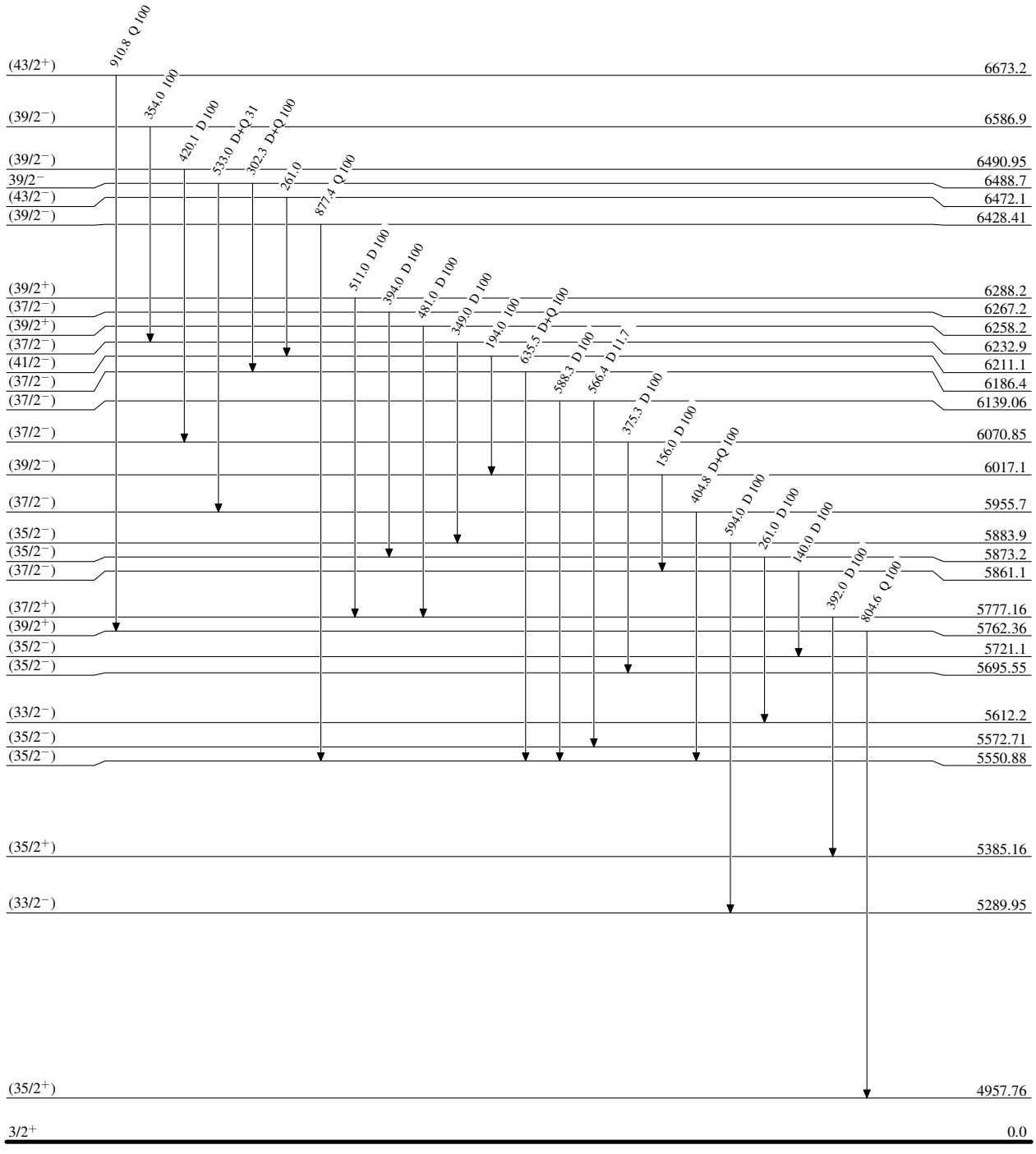


$^{139}_{60}Nd_{79}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

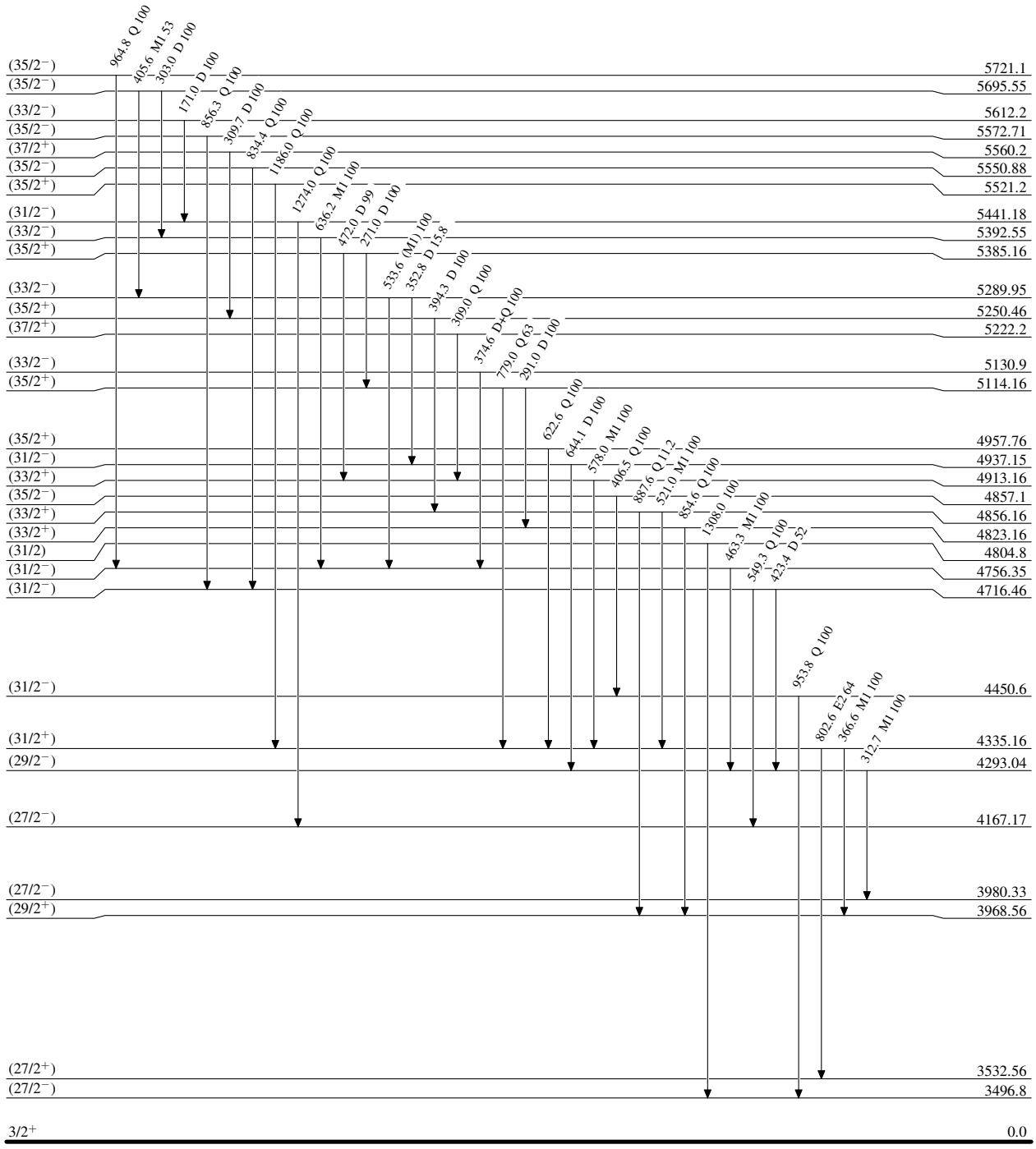


$^{139}_{60}Nd_{79}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{139}_{60}Nd_{79}$

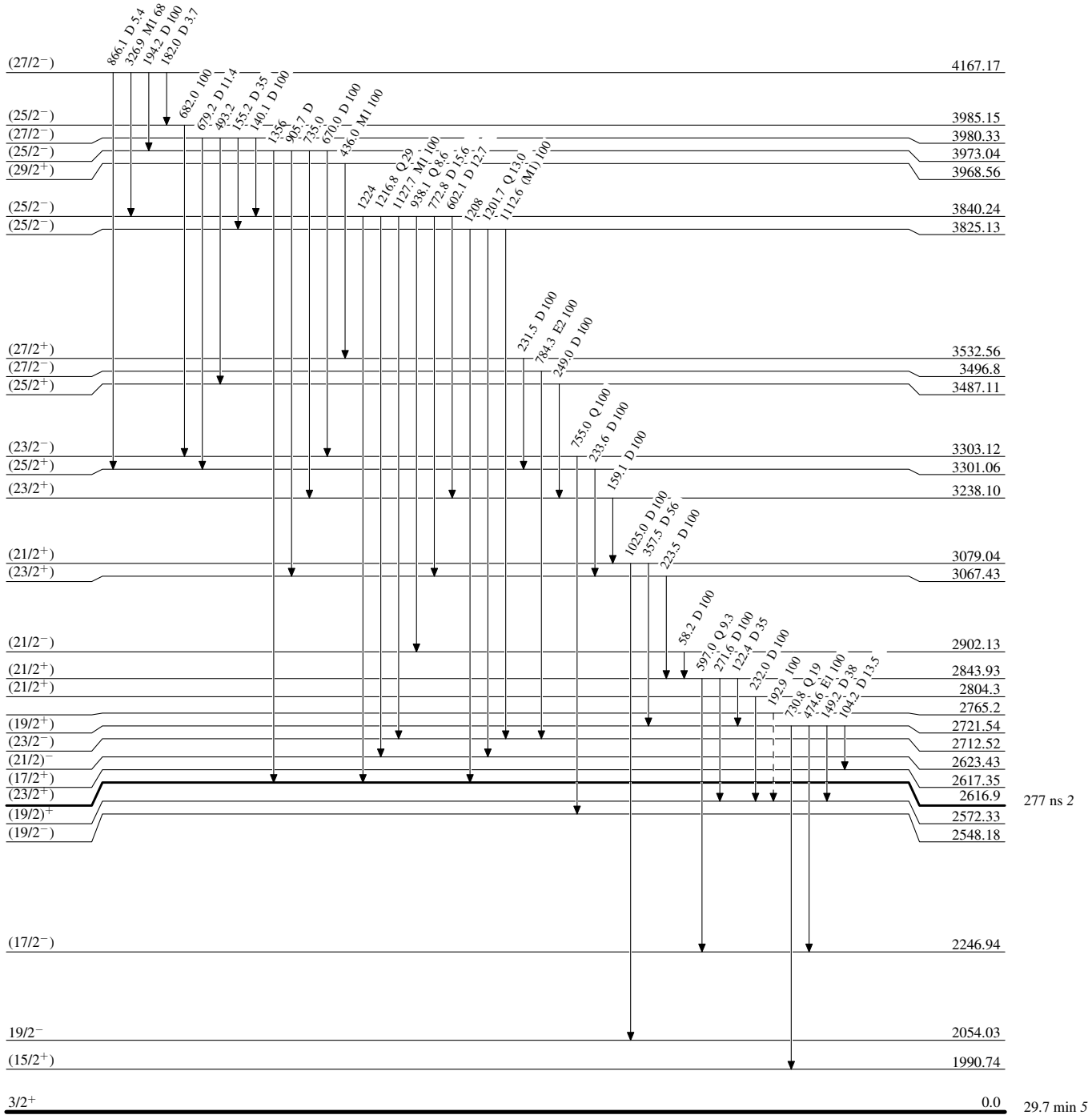
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{139}_{60}Nd_{79}$

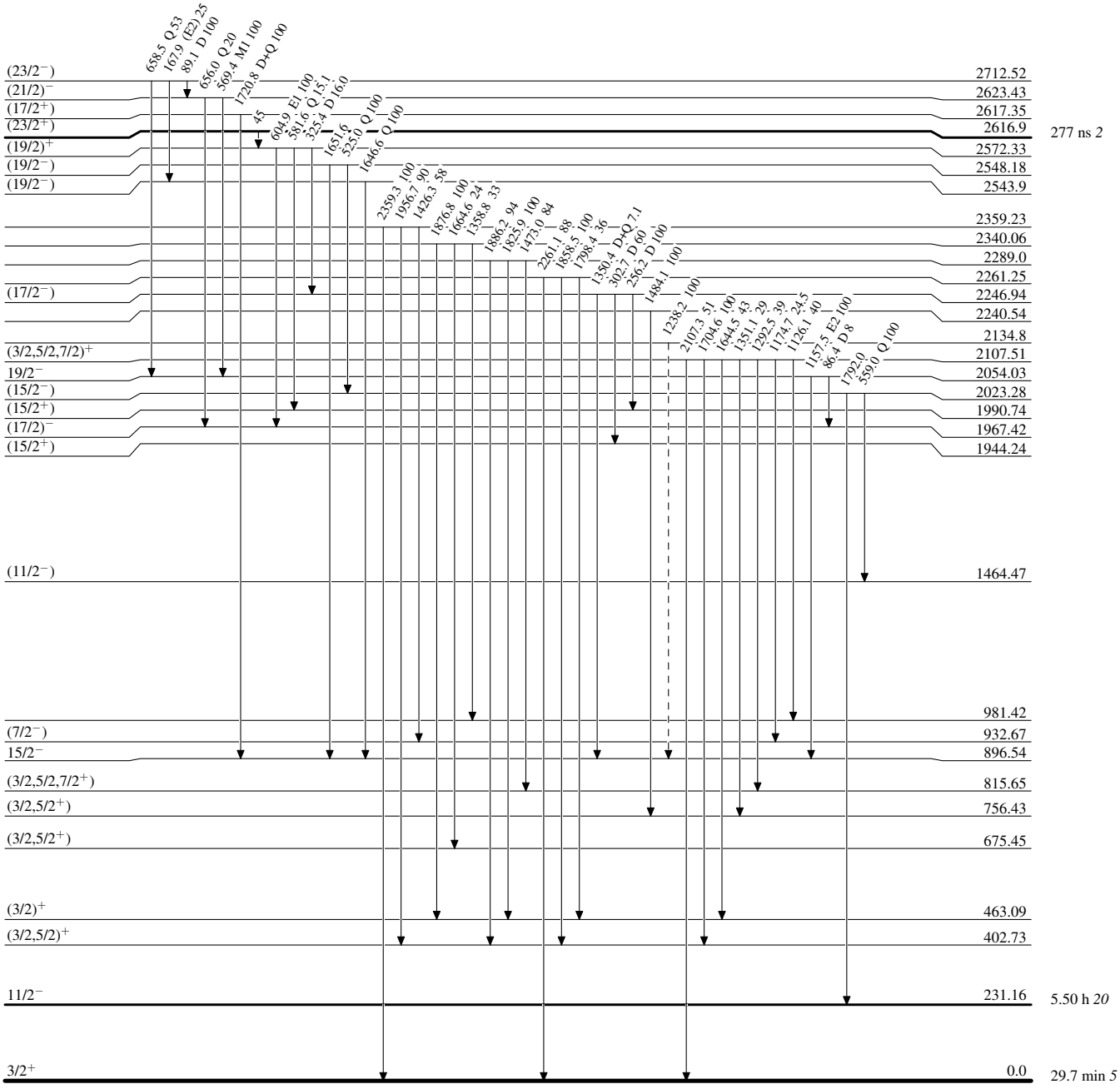
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

– – – – – – ► γ Decay (Uncertain)



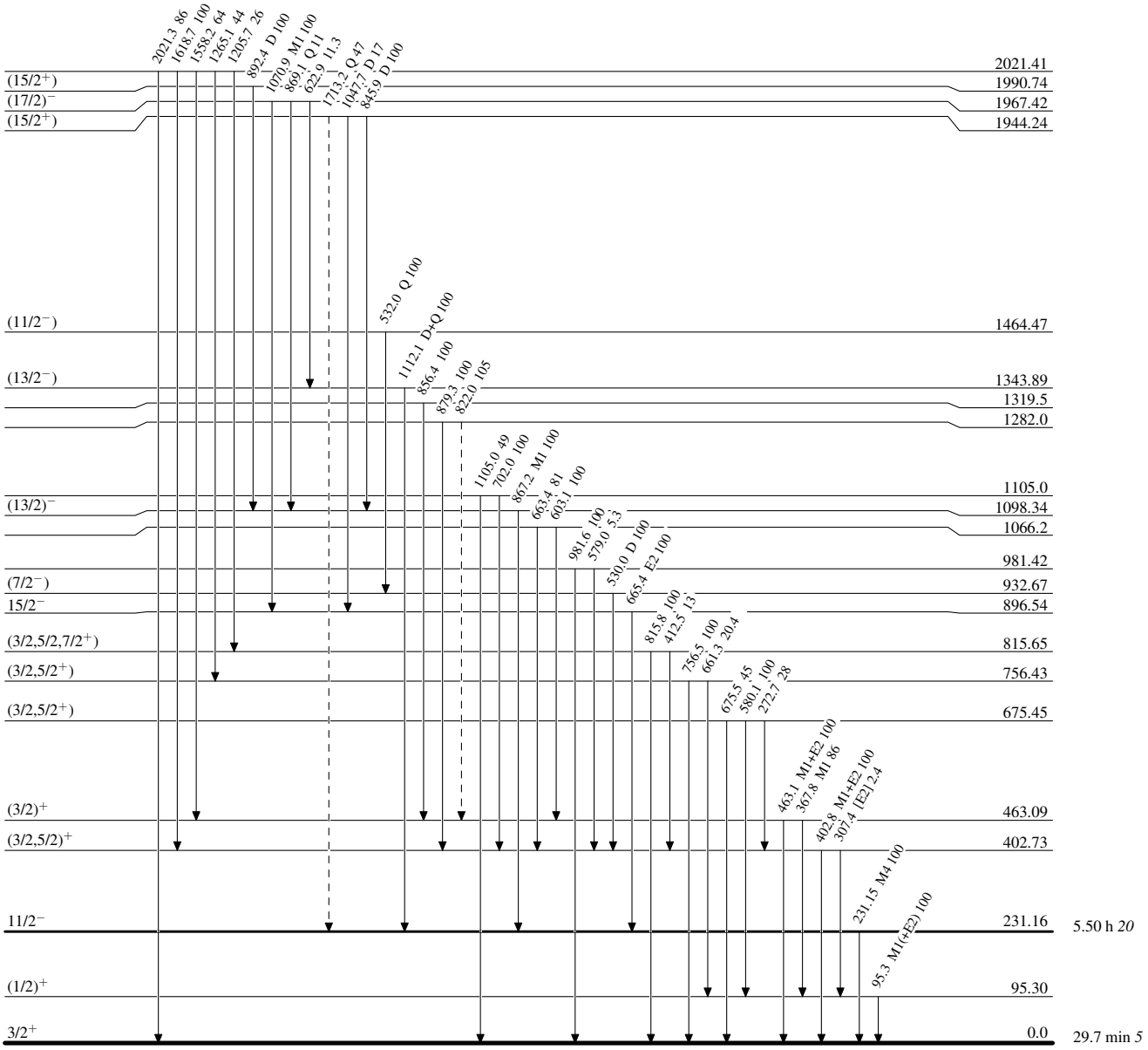
Adopted Levels, Gammas

Legend

Level Scheme (continued)

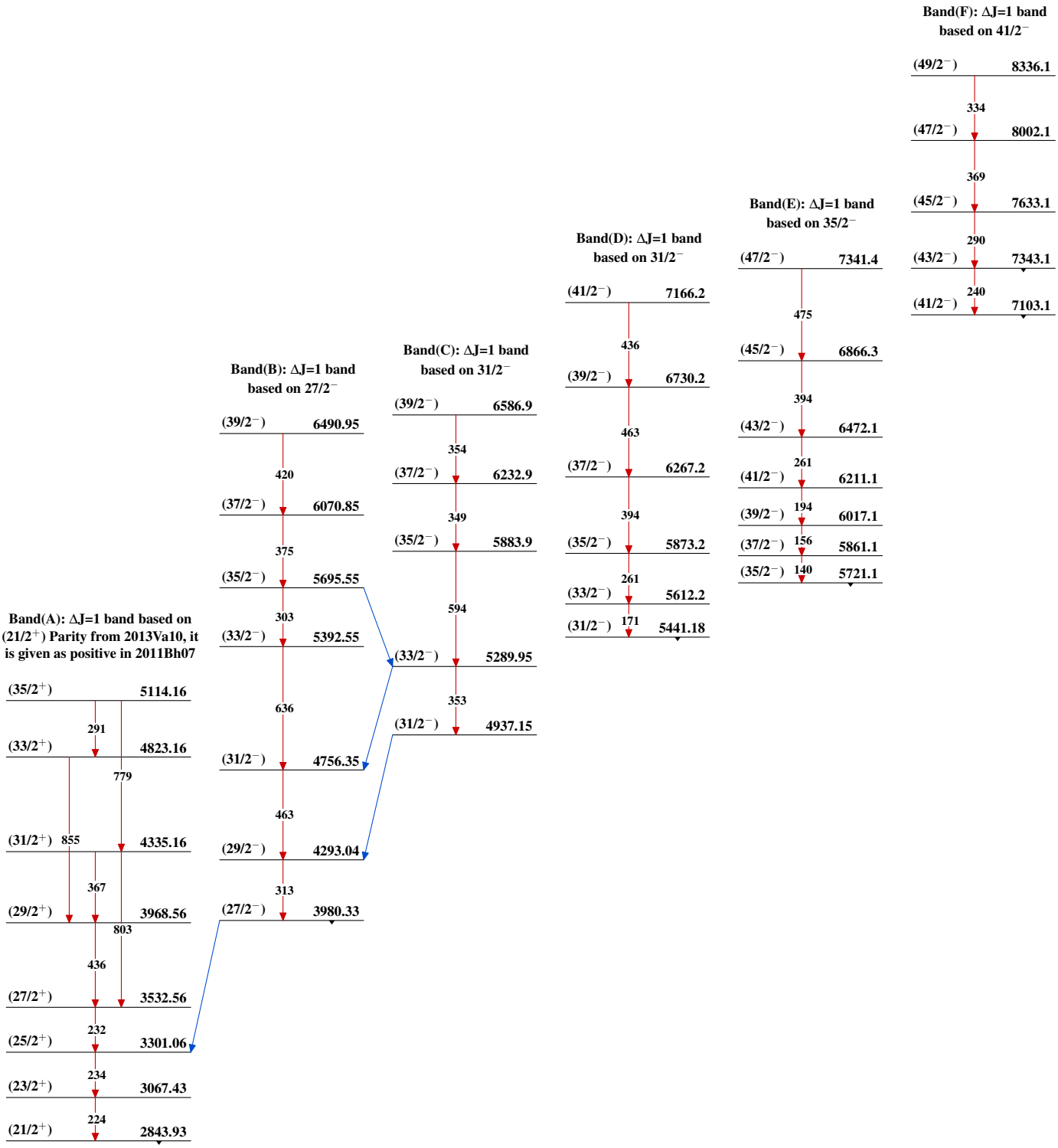
Intensities: Relative photon branching from each level

γ Decay (Uncertain)

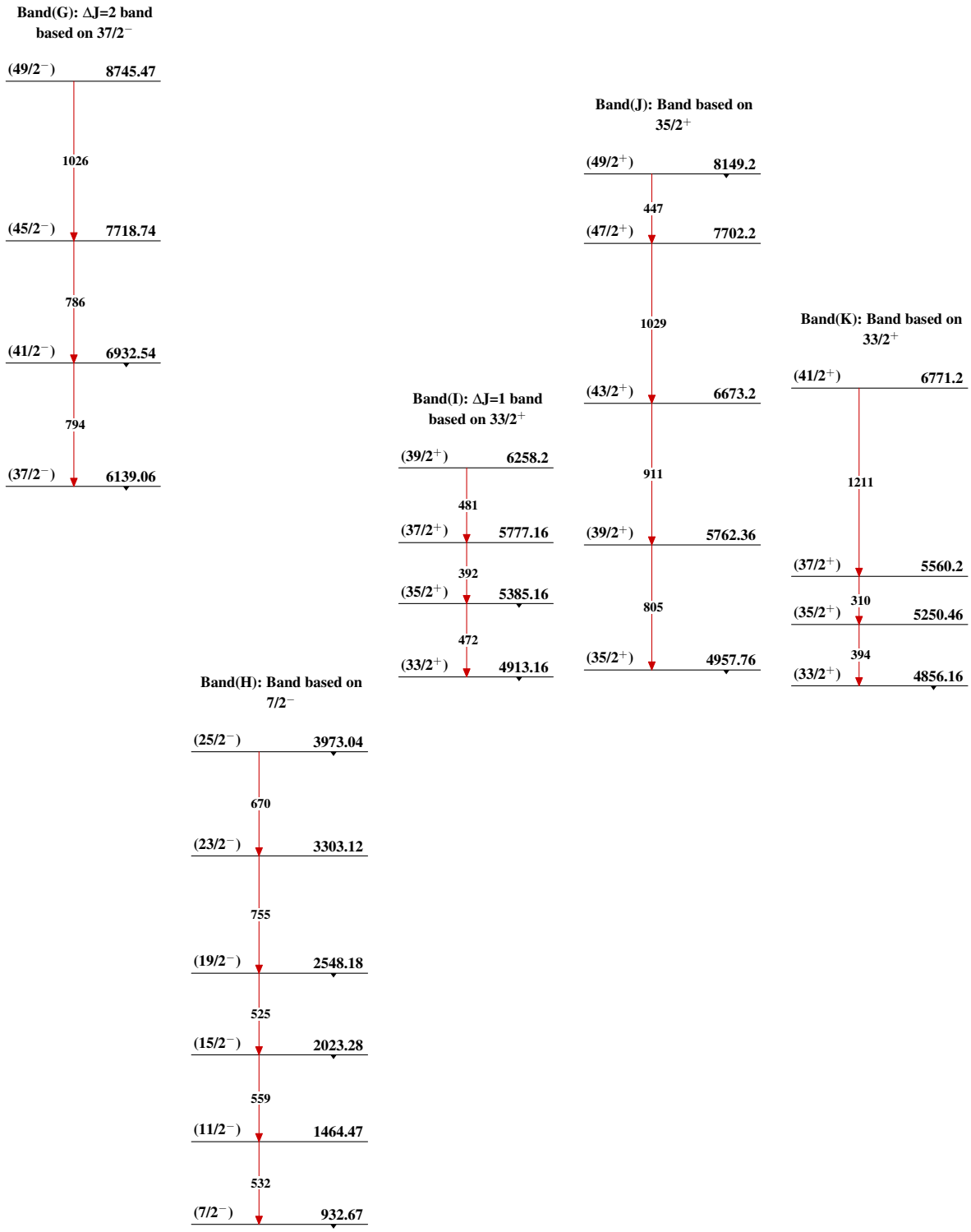


$^{139}_{60}Nd_{79}$

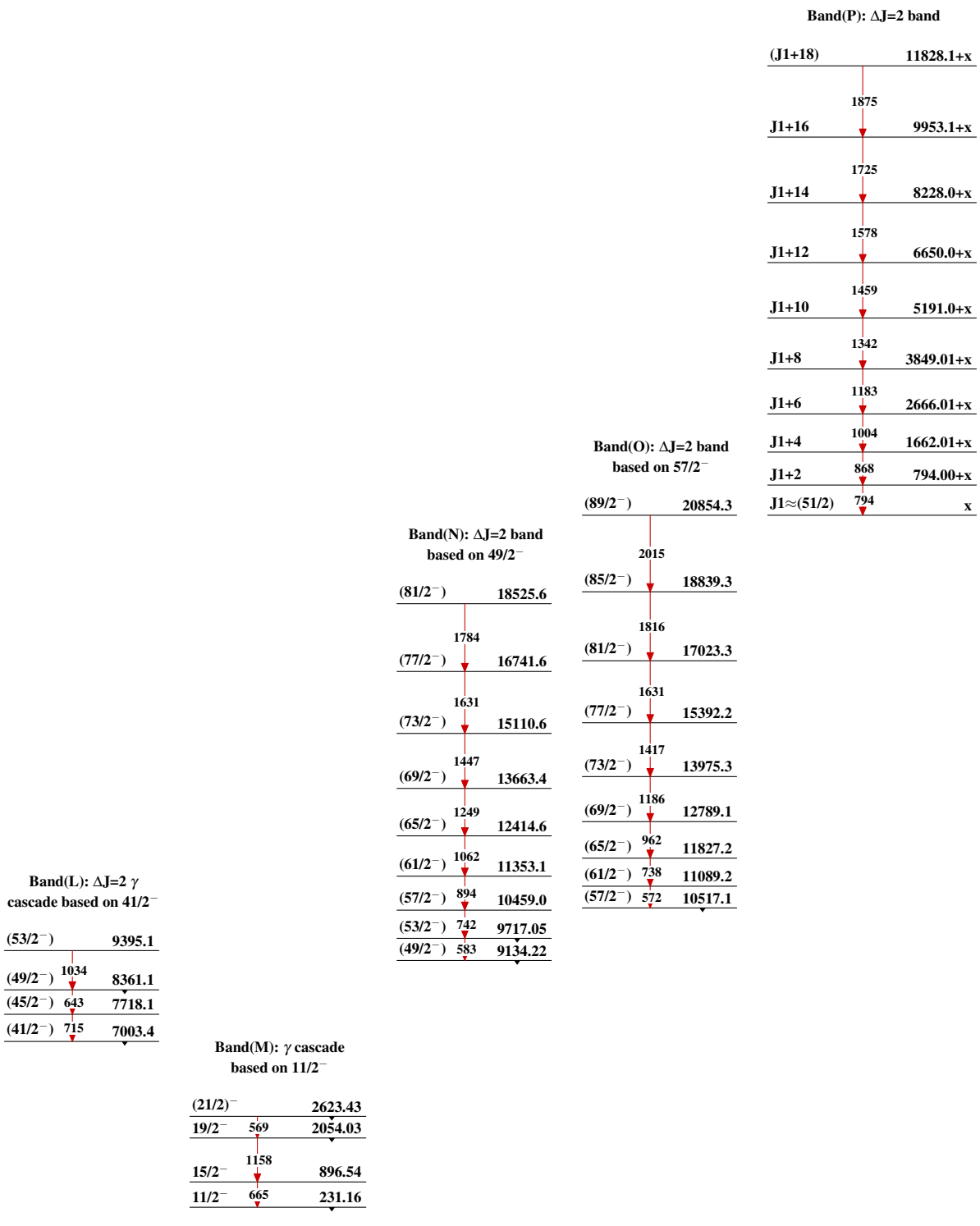
Adopted Levels, Gammas



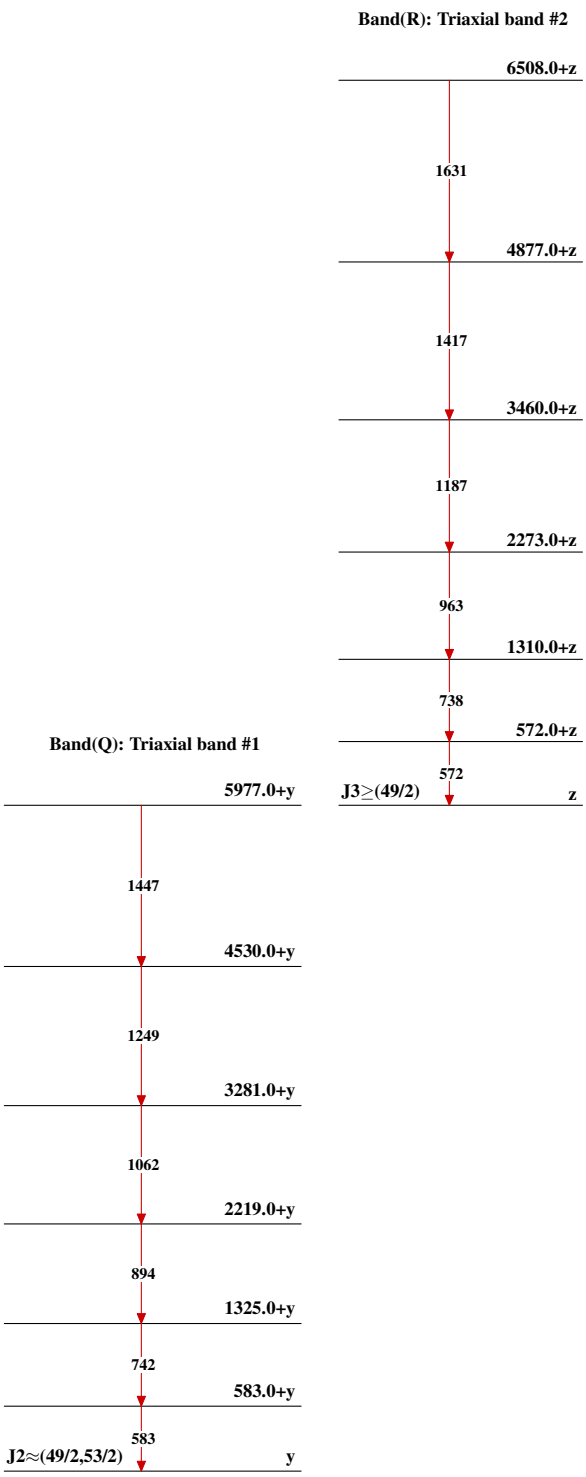
Adopted Levels, Gammas (continued)



Adopted Levels, Gammas (continued)



Adopted Levels, Gammas (continued)



$^{139}_{60}Nd_{79}$