^{150}Nd(α,p2nγ) 1990Ve14,1990Ur01

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	NDS 110, 1 (2009)	20-Nov-2008

1990Ve14: E=35 MeV. Measured γ, $\gamma\gamma$, $\gamma\gamma(\theta)$ (DCO).
1990Ur01: E=68 MeV. Measured γ, $\gamma\gamma$, $\gamma\gamma(\theta)$ (DCO).
See 1993Ra03, 1993No01, 1993Af01, 1989So08 for interpretation of high-spin states and reflection-asymmetric behavior.

^{151}Pm Levels

From enhanced (≈100 times) B(E1) rates, 1990Ve14 and 1990Ur01 propose that the observed level structure (parity doubling) is consistent with reflection-asymmetric behavior, thus suggesting an octupole deformation in ^{151}Pm.
From $\gamma\gamma$ data, 1990Ur01 mention that $T_{1/2}$<5 ns for all levels reported here.

E(level)	J$^\pi$ †	E(level)	J$^\pi$ †	E(level)	J$^\pi$ †	E(level)	J$^\pi$ †
0.0‡	5/2$^+$	329.6# *1*	(11/2)$^+$	701@	(11/2$^+$)	1377‡	(23/2$^-$)
85.1# *1*	7/2$^+$	343.8‡ *1*	11/2$^-$	827.5# *2*	(17/2$^-$)	1520#	(23/2$^+$)
116.8# *1*	5/2$^-$	427@	(7/2)$^+$	853.9‡ *2*	(17/2$^+$)	1721#	(25/2$^-$)
175.1‡ *1*	7/2$^-$	486.7‡ *1*	13/2$^+$	866@	(13/2$^+$)	1779‡	(25/2$^+$)
197.3‡ *1*	9/2$^+$	497.5# *1*	(13/2)$^-$	944.7‡ *2*	(19/2$^-$)	1878‡	(27/2$^-$)
255.6@	3/2$^+$	552@	(9/2$^+$)	1058.0# *2*	(19/2$^+$)	2434‡	(31/2$^-$)
261.2# *1*	(9/2$^-$)	597.1‡ *2*	(15/2)$^-$	1239.0# *2*	(21/2$^-$)		
325@	5/2$^+$	657.6# *2*	(15/2$^+$)	1287.5‡	(21/2$^+$)		

† From 1990Ur01, except that the parentheses have been added when data supporting the assignments are not available.
‡ Band(A): s=+i band. alternating parity structure.
# Band(B): s=−i band. alternating parity structure.
@ Band(C): (π,3/2[411]) band.

γ(^{151}Pm)

B(E1)(W.u.)′s are deduced (1990Ur01,1990Ve14) from observed E1/E2 γ-ray branching ratios from a level and the assumption of a constant Q(intrinsic) (1990Ve14 used 5.6) for all levels in the two bands. From an interpolation of the systematics of the B(E2) rates in neighboring even-even nuclides, 1990Ur01 used B(E2)(W.u.)=130, 190, 220, 270, 330 for 197γ, 245γ, 169γ, 290γ, and 236γ, respectively. 1990Ve14 give B(E1)(W.u.)≈0.0011 for E1 transitions in these bands.

E$_\gamma$	I$_\gamma$ †	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Mult.[a]	α[b]	Comments
31.7‡[c]		116.8	5/2$^-$	85.1	7/2$^+$			
58.3#		175.1	7/2$^-$	116.8	5/2$^-$			
63.9‡[c]		261.2	(9/2$^-$)	197.3	9/2$^+$			B(E1)(W.u.)>0.0021 (1990Ur01).
68.5‡[c]		329.6	(11/2)$^+$	261.2	(9/2$^-$)			B(E1)(W.u.)=0.0029 *13* (1990Ur01).
69#		325	5/2$^+$	255.6	3/2$^+$			
82.6& *2*	19 *6*	343.8	11/2$^-$	261.2	(9/2$^-$)	M1	2.68 *5*	α(K)=2.27 *4*; α(L)=0.320 *5*; α(M)=0.0684 *11*; α(N+..)=0.0179 *3* α(N)=0.01542 *25*; α(O)=0.00232 *4*; α(P)=0.0001464 *23* Mult.: from α(exp)=2.4 *6* (1990Ve14).
85.1@ *1*	67 *7*	85.1	7/2$^+$	0.0	5/2$^+$			
86.0& *2*	19 *6*	261.2	(9/2$^-$)	175.1	7/2$^-$			

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^{150}Nd(α,p2nγ) 1990Ve14,1990Ur01 (continued)

$\gamma(^{151}Pm)$ (continued)

E_γ	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[a]	α[b]	Comments
90.0[‡]		175.1	7/2$^-$	85.1	7/2$^+$			
90.8[&c] 2	<15	944.7	(19/2$^-$)	853.9	(17/2$^+$)			B(E1)(W.u.)=0.0020 *10* (1990Ur01).
99.5[@] 2	17 5	597.1	(15/2)$^-$	497.5	(13/2)$^-$	M1	1.570	α(K)=1.333 *21*; α(L)=0.187 *3*; α(M)=0.0400 *6*; α(N+..)=0.01046 *16* α(N)=0.00901 *14*; α(O)=0.001359 *21*; α(P)=8.57×10^{-5} *13* Mult.: from α(exp)=1.2 *3* (1990Ve14).
102[#]		427	(7/2)$^+$	325	5/2$^+$			
110.4[&] 2	11 3	597.1	(15/2)$^-$	486.7	13/2$^+$			B(E1)(W.u.)=0.0023 *4* (1990Ur01).
112.2[@] 1	41 4	197.3	9/2$^+$	85.1	7/2$^+$			
116.8[‡]		116.8	5/2$^-$	0.0	5/2$^+$			
117.2[&] 2	6 2	944.7	(19/2$^-$)	827.5	(17/2$^-$)			
125[#]		552	(9/2$^+$)	427	(7/2)$^+$			
132.3[&] 2	10 3	329.6	(11/2)$^+$	197.3	9/2$^+$			
138[#]		1377	(23/2$^-$)	1239.0	(21/2$^-$)			
138.8[‡]		255.6	3/2$^+$	116.8	5/2$^-$			
142.9[@] 2	14 4	486.7	13/2$^+$	343.8	11/2$^-$	D		B(E1)(W.u.)=0.0018 *4* (1990Ur01).
146.6[@] 1	47 5	343.8	11/2$^-$	197.3	9/2$^+$	E1	0.0942	α(K)=0.0800 *12*; α(L)=0.01120 *16*; α(M)=0.00238 *4*; α(N+..)=0.000610 *9* α(N)=0.000529 *8*; α(O)=7.68×10^{-5} *11*; α(P)=4.14×10^{-6} *6* Mult.: from α(exp)<0.3 (1990Ve14). B(E1)(W.u.)=0.00058 *17* (1990Ur01).
149[#c]		701	(11/2$^+$)	552	(9/2$^+$)			
153.6[@] 1	28 3	497.5	(13/2)$^-$	343.8	11/2$^-$	M1,E2	0.478 *20*	α(K)=0.36 *3*; α(L)=0.09 *4*; α(M)=0.020 *9*; α(N+..)=0.0051 *21* α(N)=0.0044 *19*; α(O)=0.00061 *22*; α(P)=2.0×10^{-5} *5* Mult.: from α(exp)=0.43 *14* (1990Ve14).
157[#c]		1878	(27/2$^-$)	1721	(25/2$^-$)			
157.1[#c]		486.7	13/2$^+$	329.6	(11/2)$^+$			
160.1[&] 2	7 2	657.6	(15/2$^+$)	497.5	(13/2)$^-$			B(E1)(W.u.)=0.0021 *6* (1990Ur01).
165[#]		866	(13/2$^+$)	701	(11/2$^+$)			
166[#c]		427	(7/2)$^+$	261.2	(9/2$^-$)			
167.9[&] 1	28 3	497.5	(13/2)$^-$	329.6	(11/2)$^+$	E1	0.0652	α(K)=0.0555 *8*; α(L)=0.00769 *11*; α(M)=0.001632 *23*; α(N+..)=0.000420 *6* α(N)=0.000364 *6*; α(O)=5.30×10^{-5} *8*; α(P)=2.92×10^{-6} *5* Mult.: from α(exp)<0.2 (1990Ve14). B(E1)(W.u.)=0.0014 *4* (1990Ur01).
168.7[&] 2	5 2	343.8	11/2$^-$	175.1	7/2$^-$			
169.9[&] 2	9 3	827.5	(17/2$^-$)	657.6	(15/2$^+$)			B(E1)(W.u.)=0.0033 *12* (1990Ur01).
171[‡]		427	(7/2)$^+$	255.6	3/2$^+$			
171.1[#]		657.6	(15/2$^+$)	486.7	13/2$^+$			
175.1[&] 1	34 4	175.1	7/2$^-$	0.0	5/2$^+$			
176.1[&] 1	100 *10*	261.2	(9/2$^-$)	85.1	7/2$^+$			B(E1)(W.u.)>0.00044 (1990Ur01).
181.0[&] 2	<15	1239.0	(21/2$^-$)	1058.0	(19/2$^+$)			B(E1)(W.u.)=0.0013 *7* (1990Ur01).
197.3[@] 1	80 8	197.3	9/2$^+$	0.0	5/2$^+$			
204.1[#c]		1058.0	(19/2$^+$)	853.9	(17/2$^+$)			

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^{150}Nd(α,p2nγ) 1990Ve14,1990Ur01 (continued)

$\gamma(^{151}Pm)$ (continued)

E_γ	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[a]	Comments
227[#]		552	$(9/2^+)$	325	$5/2^+$		
230.3[@] 2	12 4	1058.0	$(19/2^+)$	827.5	$(17/2^-)$		B(E1)(W.u.)<0.00053 (1990Ur01).
230.4[&] 2	18 6	827.5	$(17/2^-)$	597.1	$(15/2)^-$		
236.3[&] 2	11 3	497.5	$(13/2)^-$	261.2	$(9/2^-)$		
244.5[&] 1	68 7	329.6	$(11/2)^+$	85.1	$7/2^+$	Q	
253.3[@] 1	27 3	597.1	$(15/2)^-$	343.8	$11/2^-$	Q	
256[#]		255.6	$3/2^+$	0.0	$5/2^+$		
256.6[@] 2	10 3	853.9	$(17/2^+)$	597.1	$(15/2)^-$		B(E1)(W.u.)=0.0010 4 (1990Ur01).
274[#]		701	$(11/2^+)$	427	$(7/2)^+$		
289.4[&] 1	29 3	486.7	$13/2^+$	197.3	$9/2^+$	Q	
294.4[#]		1239.0	$(21/2^-)$	944.7	$(19/2^-)$		
314[#c]		866	$(13/2^+)$	552	$(9/2^+)$		
328.0[&] 2	16 5	657.6	$(15/2^+)$	329.6	$(11/2)^+$		
330.0[@] 1	21 2	827.5	$(17/2^-)$	497.5	$(13/2)^-$	Q	
342.8[‡]		1287.5	$(21/2^+)$	944.7	$(19/2^-)$		B(E1)(W.u.)=0.00092 40 (1990Ur01).
344[#]		1721	$(25/2^-)$	1377	$(23/2^-)$		
347.5[@] 1	30 3	944.7	$(19/2^-)$	597.1	$(15/2)^-$	Q	
367.2[&] 2	10 3	853.9	$(17/2^+)$	486.7	$13/2^+$		
400.4[&] 2	<15	1058.0	$(19/2^+)$	657.6	$(15/2^+)$		
402[#c]		1779	$(25/2^+)$	1377	$(23/2^-)$		
411.5[@] 2	12 4	1239.0	$(21/2^-)$	827.5	$(17/2^-)$		
432[#]		1377	$(23/2^-)$	944.7	$(19/2^-)$		
433.6[#]		1287.5	$(21/2^+)$	853.9	$(17/2^+)$		
440[#]		701	$(11/2^+)$	261.2	$(9/2^-)$		
462[#]		1520	$(23/2^+)$	1058.0	$(19/2^+)$		
482[#]		1721	$(25/2^-)$	1239.0	$(21/2^-)$		
491[#]		1779	$(25/2^+)$	1287.5	$(21/2^+)$		
501[#]		1878	$(27/2^-)$	1377	$(23/2^-)$		
556[#]		2434	$(31/2^-)$	1878	$(27/2^-)$		

[†] From 1990Ve14. Uncertainty is 10% for Iγ>20 and 30% for Iγ<20.
[‡] From 1990Ur01. Energy uncertainties and relative γ-ray intensities are not available.
[#] From level energy difference. Transition shown by 1990Ur01 in their level scheme.
[@] From γ-ray spectrum of figure 1 (1990Ve14).
[&] From level energy difference (1990Ve14). Uncertainty of 0.1 keV is assigned (evaluator) to Iγ>20 and 0.2 keV for Iγ<20.
[a] From $\gamma\gamma(\theta)$ and α(exp) estimates (from intensity balances in $\gamma\gamma$ data) (1990Ve14). 1990Ur01 have measured $\gamma\gamma(\theta)$ (DCO) but the results are not quoted in the paper. Mult=Q is E2 since $T_{1/2}$<5 ns (1990Ur01) for all levels given here.
[b] 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.
[c] Placement of transition in the level scheme is uncertain.

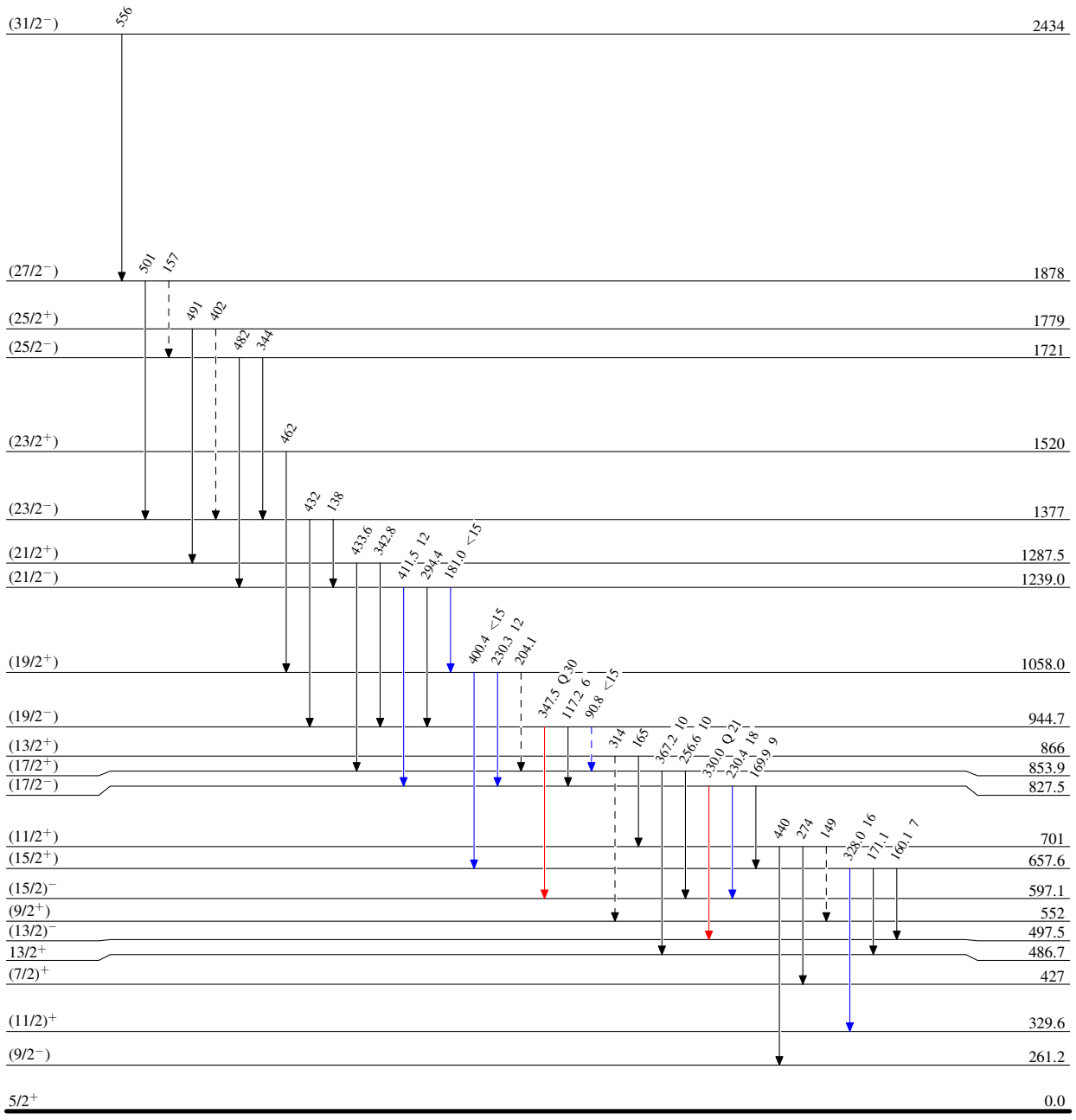
^{150}Nd(α,p2nγ) 1990Ve14,1990Ur01

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)



$^{151}_{61}Pm_{90}$

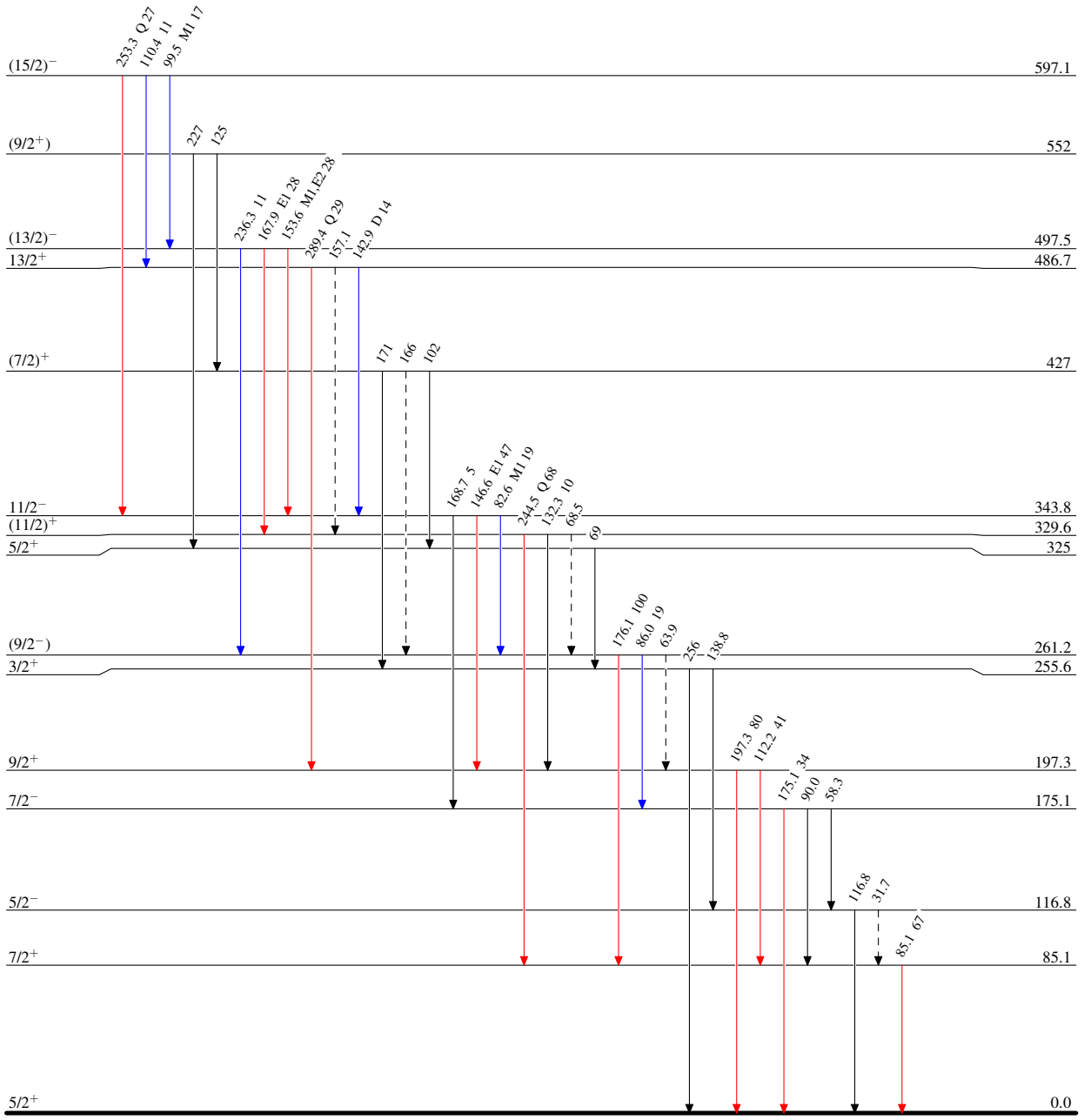
^{150}Nd(α,p2nγ) 1990Ve14,1990Ur01

Level Scheme (continued)

Intensities: Relative I_γ

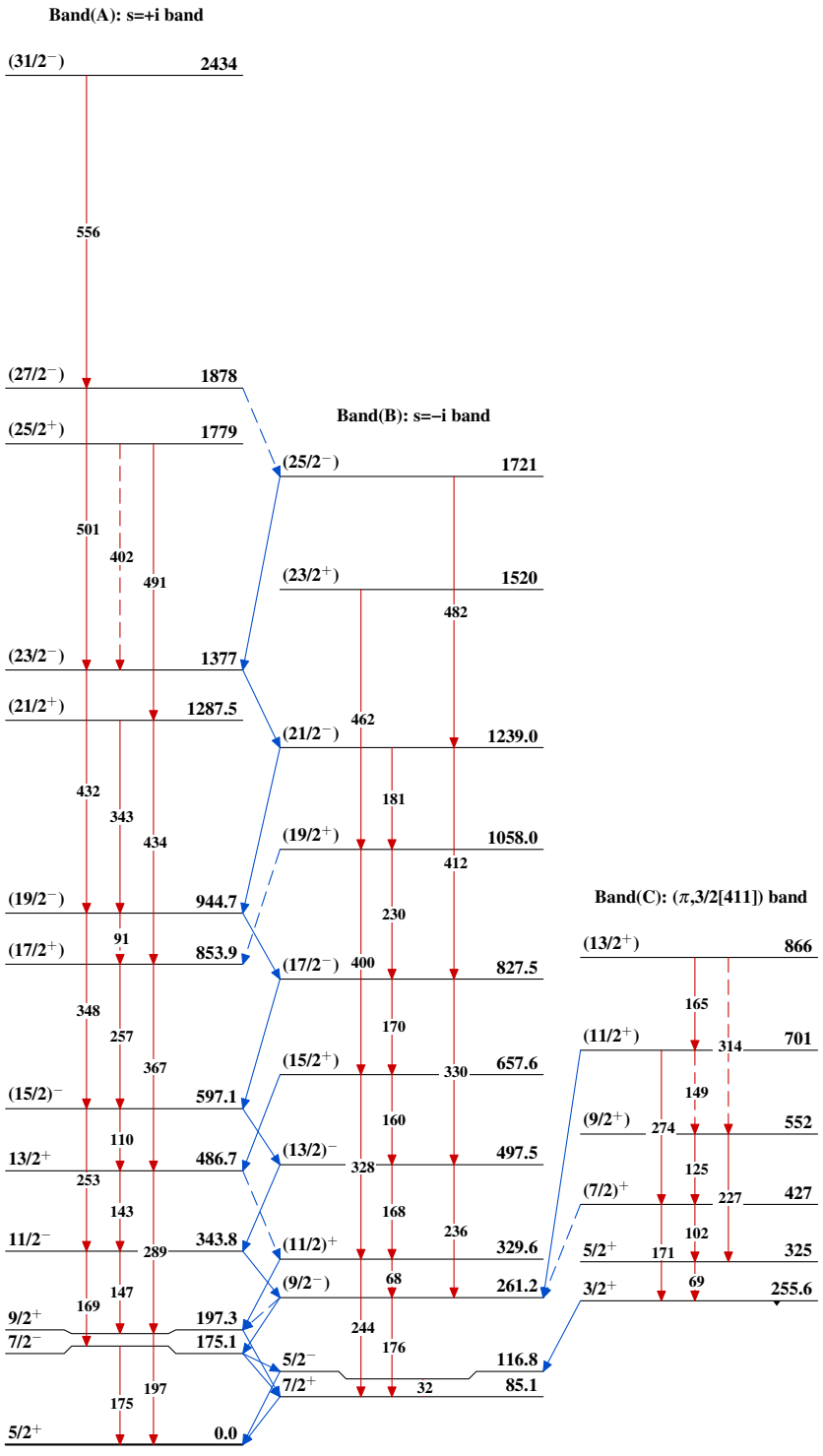
Legend

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



$^{151}_{61}Pm_{90}$

^{150}Nd(α,p2nγ) 1990Ve14,1990Ur01



$^{151}_{61}Pm_{90}$