^{150}Nd(p,2nγ) 1979Ko35

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 185, 2 (2022)	23-Aug-2022

1979Ko35: E(p)=12.1-15.8 MeV from the cyclotron of the University of Jyvaskyla. Enriched target (96%) was used for self supporting targets 0.8-2.0 mg/cm^2 thickness or mylar backed neodymium oxide targets 10 mg/cm^2 thick. Measured excitation functions, $\gamma(\theta)$ at 6 angles for E(p)=15.8 MeV, $\gamma\gamma$, γ(t).

Level scheme is based on energy fit and $\gamma\gamma$-coin.

^{149}Pm Levels

E(level)†	J$^\pi$#	T$_{1/2}$‡	Comments
0.0	7/2$^+$		
114.32 *4*	5/2$^+$	2.7 ns *2*	
188.61 *6*	3/2$^+$	3.1 ns *2*	
211.34 *5*	5/2$^+$		
240.23 *10*	11/2$^-$	35 μs *3*	T$_{1/2}$: from the Adopted Levels.
270.15 *5*	7/2$^-$	2.8 ns *2*	
288.28 *7*	(7/2,9/2)$^+$		J$^\pi$: 9/2$^+$ in the Adopted Levels.
360.10 *15*	7/2$^+$		
387.51 *8*	1/2$^+$		
396.74 *6*	5/2$^+$		
415.45 *11*	3/2$^+$		
425.30 *5*	(5/2,7/2)$^+$		J$^\pi$: 7/2$^+$ in the Adopted Levels.
462.12 *10*	3/2$^-$		
497.63 *12*	(11/2)$^+$		
510.10 *25*	(13/2,15/2$^-$)	<3 ns	J$^\pi$: (15/2)$^-$ in the Adopted Levels. 15/2 favored also by excitation function of 269γ.
515.71 *16*	(9/2)$^-$		J$^\pi$: excitation function of 275γ strongly favors J<11/2.
537.83 *8*	5/2$^-$		
547.11 *13*	(5/2,7/2)		J$^\pi$: (5/2,7/2$^+$) in the Adopted Levels.
558.22 *18*	(7/2,9/2)		J$^\pi$: (9/2)$^+$ in the Adopted Levels.
650.89 *10*	(5/2,7/2)		J$^\pi$: (5/2$^+$) in the Adopted Levels.
655.35 *15*	7/2$^-$		
666.57 *13*	(7/2$^-$,9/2$^+$)		
716.71 *19*	(3/2$^-$)		
721.35 *23*	7/2$^+$		
750.75 *21*	(7/2$^-$,9/2$^+$)		
767.8 *5*	(5/2,7/2$^+$)		
771.36 *25*	(13/2$^-$)@		
778.92 *13*	(13/2)$^+$@		
791.08 *21*	11/2$^-$@		
808.61 *24*	(11/2)$^+$@		
885.9 *5*	(11/2,13/2$^+$)@		

† From least-squares fit to Eγ data.

‡ From γ(t) (1979Ko35).

\# As given in 1979Ko35 up to 655 level, based on $\gamma(\theta)$ data and decay pattern. Above this energy the assignments are from the Adopted Levels as none are given in 1979Ko35. Up to 655 level, when J^π assignments differ in the Adopted Levels, the latter are given in comments.

@ Excitation function suggests J≥11/2 (1979Ko35).

^{150}Nd(p,2nγ) 1979Ko35 (continued)

γ(^{149}Pm)

Eγ	Iγ[†]	Ei(level)	J^{π}_{i}	E_f	J^{π}_{f}	Mult.[#]	Comments
58.81 5	4.5 5	270.15	7/2⁻	211.34	5/2⁺		E1 in 1979Ko35.
74.3 1	15 3	188.61	3/2⁺	114.32	5/2⁺		
97.04 5	2.5 5	211.34	5/2⁺	114.32	5/2⁺	D+Q	A_2=+0.05 3; A_4=−0.02 4 M1+E2 in 1979Ko35.
114.35 5	100	114.32	5/2⁺	0.0	7/2⁺	D+Q	A_2=−0.04 1; A_4≈0 M1+E2 in 1979Ko35.
126.59 6	0.9 2	396.74	5/2⁺	270.15	7/2⁻	D	A_2=−0.12 8; A_4≈0 E1 in 1979Ko35.
137.01 6	1.5 3	425.30	(5/2,7/2)⁺	288.28	(7/2,9/2)⁺		
155.85 6	21.0 20	270.15	7/2⁻	114.32	5/2⁺	D	A_2=−0.06 1; A_4=−0.02 1 E1 in 1979Ko35.
185.42 8	1.0 2	396.74	5/2⁺	211.34	5/2⁺		
188.58 8	20.5 20	188.61	3/2⁺	0.0	7/2⁺		E2 in 1979Ko35.
191.97 8	3.6 6	462.12	3/2⁻	270.15	7/2⁻		E2 in 1979Ko35.
198.1[‡] 1	4.5[‡] 8	558.22	(7/2,9/2)	360.10	7/2⁺		
198.9 1	20 4	387.51	1/2⁺	188.61	3/2⁺		M1 in 1979Ko35.
208.15 9	26 3	396.74	5/2⁺	188.61	3/2⁺	D	A_2=−0.03 2; A_4≈0 M1 in 1979Ko35.
209.2 2	5.0 10	497.63	(11/2)⁺	288.28	(7/2,9/2)⁺		
211.27 10	61 5	211.34	5/2⁺	0.0	7/2⁺	D+Q	A_2=+0.03 1; A_4≈0 M1+E2 in 1979Ko35.
213.96 10	9.8 10	425.30	(5/2,7/2)⁺	211.34	5/2⁺	D+Q	A_2=+0.13 2; A_4=+0.03 3 M1+E2 in 1979Ko35.
226.80 12	5.6 6	415.45	3/2⁺	188.61	3/2⁺		
240.19 12	105 5	240.23	11/2⁻	0.0	7/2⁺	M2	Mult.: from the Adopted Gammas.
241.2[‡] 3	4.0[‡] 15	666.57	(7/2⁻,9/2⁺)	425.30	(5/2,7/2)⁺		
245.5[‡] 3	8.0[‡] 20	515.71	(9/2)⁻	270.15	7/2⁻		
245.7 3	37 3	360.10	7/2⁺	114.32	5/2⁺	(D+Q)	A_2=−0.01 1; A_4=+0.01 2 (M1+E2) in 1979Ko35.
250.3 2	4.2 8	808.61	(11/2)⁺	558.22	(7/2,9/2)		
254.17 12	6.5 8	650.89	(5/2,7/2)	396.74	5/2⁺		
261.25 12	5.4 8	771.36	(13/2⁻)	510.10	(13/2,15/2⁻)		
267.68 15	7.8 7	537.83	5/2⁻	270.15	7/2⁻	D	A_2=−0.13 3; A_4≈0 M1 in 1979Ko35.
269.8 3	43 5	510.10	(13/2,15/2⁻)	240.23	11/2⁻	(D+Q)	A_2=+0.17 2; A_4=+0.02 2 Mult.: (D+Q) from γ(θ) data deduced from A_2=+0.13 1, A_4=+0.01 1 for 269.8γ+270.1γ, using theoretical γ(θ) for 270.1γ (E1 with ΔJ=0) and attenuation factor (for A_2)=+0.17 derived from 155γ(θ). (M1+E2) in 1979Ko35.
270.1 3	38 5	270.15	7/2⁻	0.0	7/2⁺	D	A_2=+0.08 1; A_4≈0 γ(θ) data for 270 doublet. See comment on 269.8γ. E1 in 1979Ko35.
ˣ272.0 1	4.4 8						
273.2 1	2.4 5	387.51	1/2⁺	114.32	5/2⁺		M1,E2 in 1979Ko35.
275.50 15	23.5 20	515.71	(9/2)⁻	240.23	11/2⁻	D(+Q)	A_2=−0.19 1; A_4≈0 M1+E2 in 1979Ko35.
276.95 15	18.5 15	547.11	(5/2,7/2)	270.15	7/2⁻	D	A_2=−0.04 2; A_4=−0.02 2
281.3 1	2.2 4	778.92	(13/2)⁺	497.63	(11/2)⁺		
282.4 1	6.1 5	396.74	5/2⁺	114.32	5/2⁺	D+Q	A_2=+0.08 2; A_4≈0 M1+E2 in 1979Ko35.
288.22 15	65 5	288.28	(7/2,9/2)⁺	0.0	7/2⁺	D+Q	A_2=+0.32 1; A_4=−0.02 1 M1+E2 in 1979Ko35.

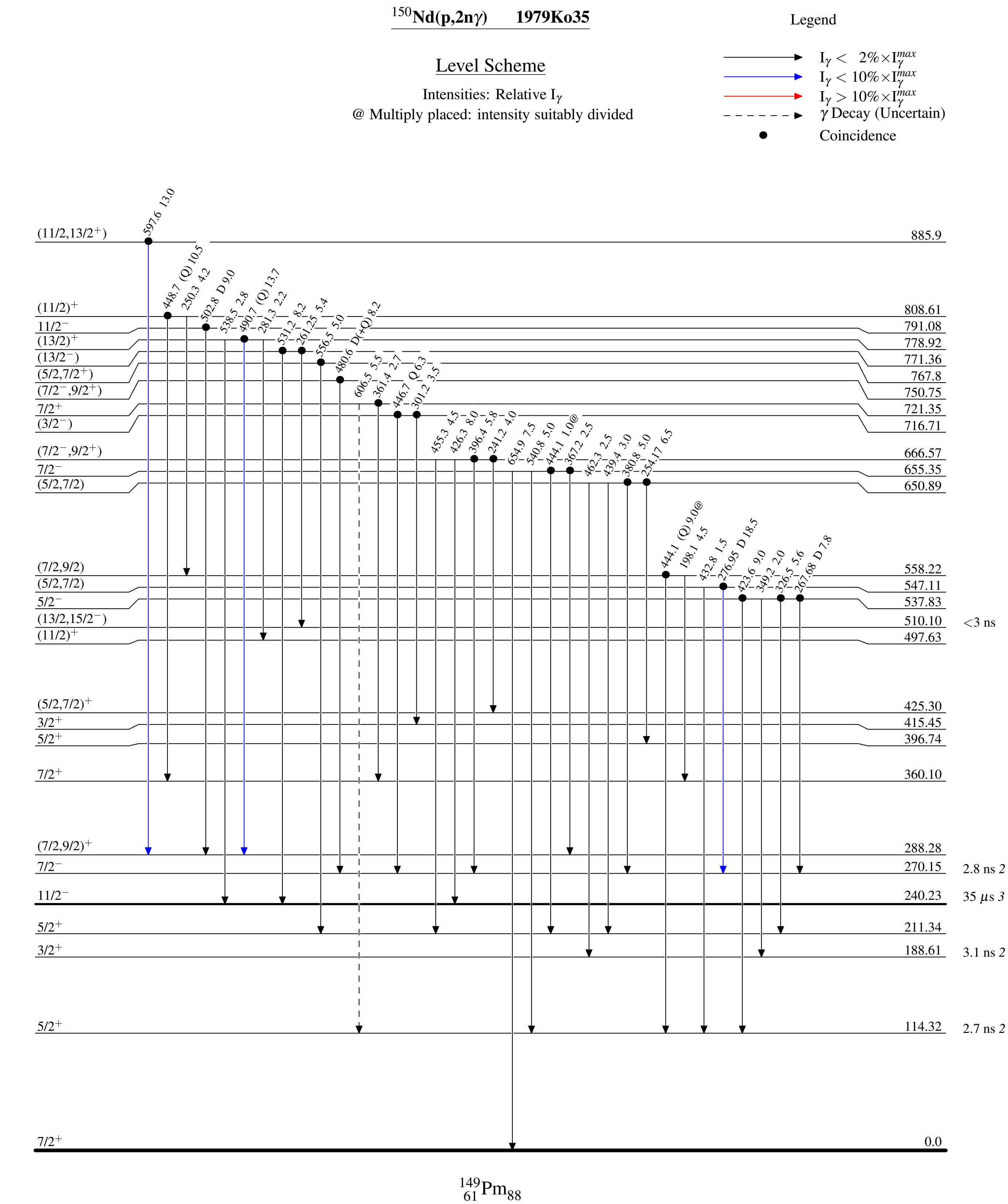
Continued on next page (footnotes at end of table)

^{150}Nd(p,2nγ) 1979Ko35 (continued)

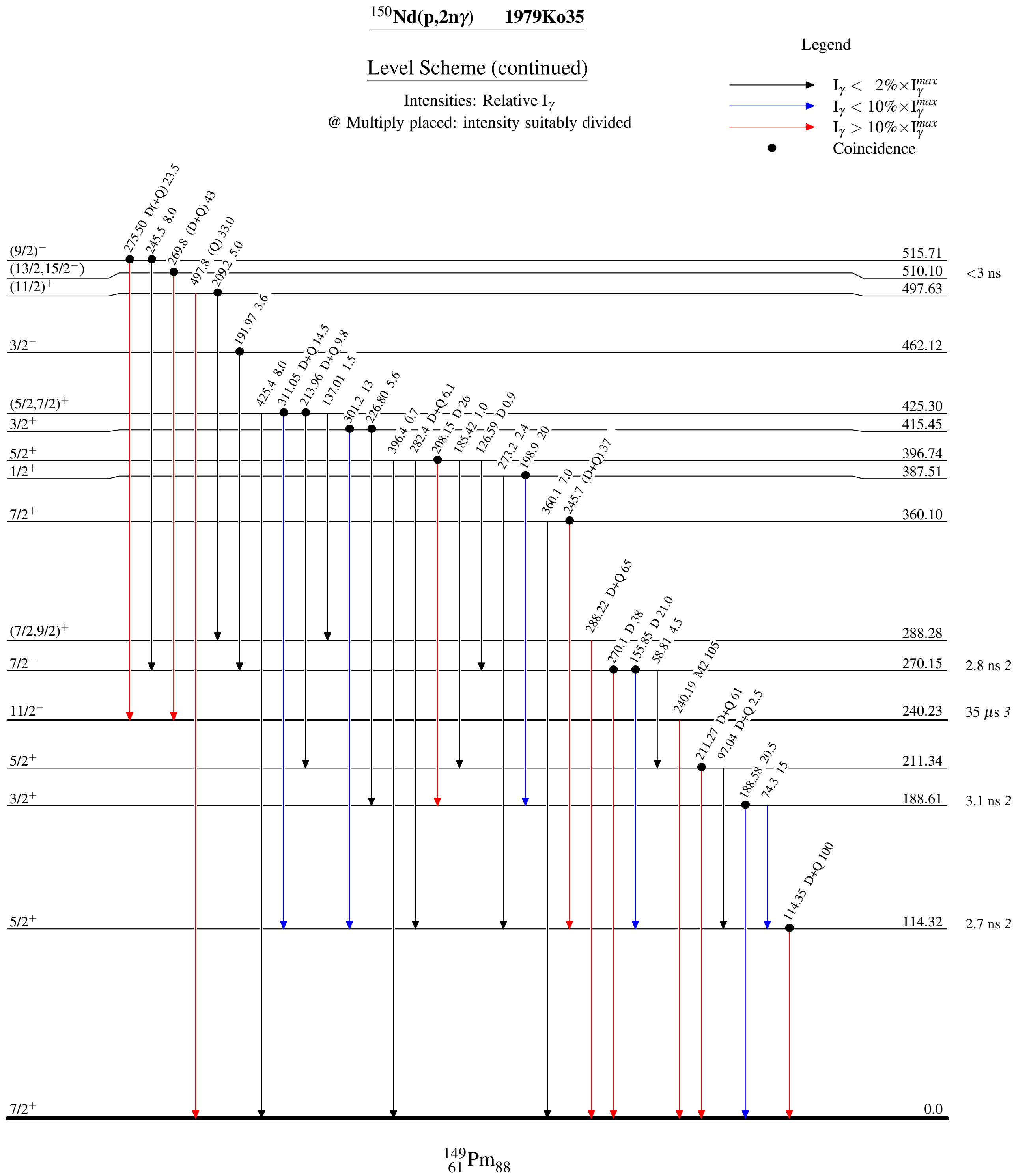
γ(^{149}Pm) (continued)

E_γ	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	Comments
301.2 2	13 3	415.45	3/2$^+$	114.32	5/2$^+$		
301.2[‡] 2	3.5[‡] 10	716.71	(3/2$^-$)	415.45	3/2$^+$		
311.05 15	14.5 15	425.30	(5/2,7/2)$^+$	114.32	5/2$^+$	D+Q	A_2=+0.10 1; A_4=+0.02 1 M1+E2 in 1979Ko35.
326.5 1	5.6 8	537.83	5/2$^-$	211.34	5/2$^+$		E1 in 1979Ko35.
349.2 1	2.0 5	537.83	5/2$^-$	188.61	3/2$^+$		E1 in 1979Ko35.
360.1 2	7.0 12	360.10	7/2$^+$	0.0	7/2$^+$		
361.4[‡] 2	2.7[‡] 6	721.35	7/2$^+$	360.10	7/2$^+$		
367.2 2	2.5 12	655.35	7/2$^-$	288.28	(7/2,9/2)$^+$		
380.8 2	5.0 8	650.89	(5/2,7/2)	270.15	7/2$^-$		
396.4 3	0.7 3	396.74	5/2$^+$	0.0	7/2$^+$		
396.4[‡] 3	5.8[‡] 2	666.57	(7/2$^-$,9/2$^+$)	270.15	7/2$^-$		
423.6 2	9.0 10	537.83	5/2$^-$	114.32	5/2$^+$		E1 in 1979Ko35.
425.4 2	8.0 15	425.30	(5/2,7/2)$^+$	0.0	7/2$^+$		
426.3 2	8.0 15	666.57	(7/2$^-$,9/2$^+$)	240.23	11/2$^-$		
432.8 2	1.5 5	547.11	(5/2,7/2)	114.32	5/2$^+$		
439.4 2	3.0 7	650.89	(5/2,7/2)	211.34	5/2$^+$		
444.1[@] 5	9.0[@] 20	558.22	(7/2,9/2)	114.32	5/2$^+$	(Q)	A_2=+0.13 3; A_4=−0.03 4
444.1[@‡] 5	1.0[@‡] 3	655.35	7/2$^-$	211.34	5/2$^+$		E1 in 1979Ko35.
446.7 3	6.3 12	716.71	(3/2$^-$)	270.15	7/2$^-$	Q	A_2=+0.18 4; A_4=−0.13 6
448.7 3	10.5 15	808.61	(11/2)$^+$	360.10	7/2$^+$	(Q)	A_2=+0.25 5; A_4=+0.07 7
[x]450.1 3	3.0 6						
455.3 2	4.5 8	666.57	(7/2$^-$,9/2$^+$)	211.34	5/2$^+$		
462.3 2	2.5 5	650.89	(5/2,7/2)	188.61	3/2$^+$		
480.6 2	8.2 10	750.75	(7/2$^-$,9/2$^+$)	270.15	7/2$^-$	D(+Q)	A_2=−0.13 4; A_4=+0.05 6
490.7 2	13.7 12	778.92	(13/2)$^+$	288.28	(7/2,9/2)$^+$	(Q)	A_2=+0.26 3; A_4=+0.07 4
497.8 2	33.0 20	497.63	(11/2)$^+$	0.0	7/2$^+$	(Q)	A_2=+0.24 2; A_4≈0 (E2) in 1979Ko35.
502.8 2	9.0 12	791.08	11/2$^-$	288.28	(7/2,9/2)$^+$	D	A_2=−0.08 7; A_4≈0
531.2 3	8.2 12	771.36	(13/2$^-$)	240.23	11/2$^-$		
538.5 3	2.8 10	778.92	(13/2)$^+$	240.23	11/2$^-$		
540.8 3	5.0 12	655.35	7/2$^-$	114.32	5/2$^+$		E1 in 1979Ko35.
[x]547.8 3	3.2 7						
556.5 5	5.0 15	767.8	(5/2,7/2$^+$)	211.34	5/2$^+$		
597.6 5	13.0 20	885.9	(11/2,13/2$^+$)	288.28	(7/2,9/2)$^+$		
606.5[&] 4	5.5 12	721.35	7/2$^+$	114.32	5/2$^+$		Placement suggested by evaluators.
[x]635.0 5	5.0 10						
[x]651.4 5	7.2 15						
654.9 5	7.5 15	655.35	7/2$^-$	0.0	7/2$^+$		E1 in 1979Ko35.
[x]787.1 5	6.3 12						
[x]790.1 5	4.5 9						
[x]799.7 5	8.5 10						
[x]812.8 5	3.5 7						

[†] At 125° and E(p)=14.3 MeV.
[‡] From γγ-coin data.
[#] From γ(θ) in 1979Ko35. The evaluators assign D for ΔJ=1, dipole (M1 or E1) and Q for ΔJ=2, quadrupole (likely E2) due to lack of experimental evidence in this work for magnetic or electric nature of transitions. Assignments in Table 1 of 1979Ko35 are listed in comments, some of which are apparently from ΔJ^π.
[@] Multiply placed with intensity suitably divided.
[&] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.



150Nd(p,2nγ) 1979Ko35
Level Scheme
Intensities: Relative Iγ
@ Multiply placed: intensity suitably divided
Legend
Iγ < 2%×Iγmax
Iγ < 10%×Iγmax
Iγ > 10%×Iγmax
γ Decay (Uncertain)
Coincidence
(11/2,13/2+) 885.9
(11/2)+ 808.61
11/2− 791.08
(13/2)+ 778.92
(13/2−) 771.36
(5/2,7/2+) 767.8
(7/2−,9/2+) 750.75
7/2+ 721.35
(3/2−) 716.71
(7/2−,9/2+) 666.57
7/2− 655.35
(5/2,7/2) 650.89
(7/2,9/2) 558.22
(5/2,7/2) 547.11
5/2− 537.83
(13/2,15/2−) 510.10 <3 ns
(11/2)+ 497.63
(5/2,7/2)+ 425.30
3/2+ 415.45
5/2+ 396.74
7/2+ 360.10
(7/2,9/2)+ 288.28
7/2− 270.15 2.8 ns 2
11/2− 240.23 35 μs 3
5/2+ 211.34
3/2+ 188.61 3.1 ns 2
5/2+ 114.32 2.7 ns 2
7/2+ 0.0
597.6 13.0
448.7 (Q) 10.5
250.3 4.2
502.8 D 9.0
538.5 2.8
490.7 (Q) 13.7
281.3 2.2
531.2 8.2
261.25 5.4
556.5 5.0
480.6 D(+Q) 8.2
606.5 5.5
361.4 2.7
446.7 Q 6.3
301.2 3.5
455.3 4.5
426.3 8.0
396.4 5.8
241.2 4.0
654.9 7.5
540.8 5.0
444.1 1.0@
367.2 2.5
462.3 2.5
439.4 3.0
380.8 5.0
254.17 6.5
444.1 (Q) 9.0@
198.1 4.5
432.8 1.5
276.95 D 18.5
423.6 9.0
349.2 2.0
326.5 5.6
267.68 D 7.8
149 61Pm88



150Nd(p,2nγ) 1979Ko35
Level Scheme (continued)
Intensities: Relative Iγ
@ Multiply placed: intensity suitably divided
Legend
Iγ < 2%×Iγmax
Iγ < 10%×Iγmax
Iγ > 10%×Iγmax
Coincidence
(9/2)− 515.71
(13/2,15/2−) 510.10 <3 ns
(11/2)+ 497.63
3/2− 462.12
(5/2,7/2)+ 425.30
3/2+ 415.45
5/2+ 396.74
1/2+ 387.51
7/2+ 360.10
(7/2,9/2)+ 288.28
7/2− 270.15 2.8 ns 2
11/2− 240.23 35 μs 3
5/2+ 211.34
3/2+ 188.61 3.1 ns 2
5/2+ 114.32 2.7 ns 2
7/2+ 0.0
275.50 D(+Q) 23.5
245.5 8.0
269.8 (D+Q) 43
497.8 (Q) 33.0
209.2 5.0
191.97 3.6
425.4 8.0
311.05 D+Q 14.5
213.96 D+Q 9.8
137.01 1.5
301.2 13
226.80 5.6
396.4 0.7
282.4 D+Q 6.1
208.15 D 26
185.42 1.0
126.59 D 0.9
273.2 2.4
198.9 20
360.1 7.0
245.7 (D+Q) 37
288.22 D+Q 65
270.1 D 38
155.85 D 21.0
58.81 4.5
240.19 M2 105
211.27 D+Q 61
97.04 D+Q 2.5
188.58 20.5
74.3 15
114.35 D+Q 100
149 61 Pm 88