

$^{156}\text{Gd}(n,\gamma)$ E=resonance 2003Bo25

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 132, 1 (2016)	4-Dec-2015

Data from 2003Bo25 were originally compiled for XUNDL database by M. Lee and B. Singh, McMaster University (Oct. 2003). γ -ray spectra were measured with Ge detector at 16 neutron resonances from 33.23 to 1143 eV by time-of-flight technique.

Measured E_γ and I_γ .

 ^{157}Gd Levels

E(level) [†]	J^π [‡]	Comments
0.0 [#]	3/2 ⁻	
54.64 [#] 8	5/2 ⁻	
63.97 [@] 11	5/2 ⁺	
115.66 [@] 12	7/2 ⁺	
131.71 [#] 11	7/2 ⁻	
180.2 [@] 4	9/2 ⁺	
227.2 [#] 3	9/2 ⁻	
434.58 ^{&} 15	5/2 ⁻	
474.75 ^b 8	3/2 ⁺	
515.07 ^{&} 19	7/2 ⁻	
524.87 ^b 11	5/2 ⁺	
607.6 ^b 3	7/2 ⁺	J^π : Assignment in Adopted Levels is 5/2 ⁺ , 7/2 ⁺ .
682.99 ^c 10	1/2 ⁺	
683.15 ^d 13	3/2 ⁺	
686.70 ^d 13	5/2 ⁺	J^π : Assignment in Adopted Levels is 5/2 ⁺ , 7/2 ⁺ .
701.54 ^a 7	1/2 ⁻	
729.42 ^a 7	3/2 ⁻	
751.61 ^c 13	3/2 ⁺	
762.76 ^e 7	3/2 ⁻	
771.3 ^d 7	7/2 ⁺	
788.69 ^a 15	5/2 ⁻	
793.73 ^f 8	1/2 ⁻	J^π : Assignment in Adopted Levels is 1/2 ⁻ , 3/2 ⁻ .
809.16 ^f 9	3/2 ⁻	
814.27 ^e 18	5/2 ⁻	
937.1 6	(1/2, 3/2) ⁺	
973.8 5	(1/2, 3/2) ⁺	
1041.7 5	(1/2, 3/2) ⁻	
1049.9 4	5/2, (7/2)	J^π : No assignment in Adopted Levels.
1093.0 15	(1/2, 3/2) ⁺	
1108.2 15	(1/2 ⁺ , 3/2 ⁺)	
1157.9 15	(1/2, 3/2) ⁺	
1166.7 15	(1/2, 3/2) ⁺	
1238.0 15	(1/2, 3/2) ⁺	
1247.0 15	(1/2, 3/2) ⁺	
1285.7 15	(1/2, 3/2)	
1297.4 15	(1/2, 3/2)	
1316.9 15	(1/2 ⁻ , 3/2 ⁻)	
1333.7 15	(1/2 ⁺ , 3/2 ⁺)	
1350.1 15	(1/2, 3/2) ⁻	
1387.0 15	(1/2, 3/2)	
1413.6 15	(1/2, 3/2) ⁻	

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¹⁵⁶Gd(n,γ) E=resonance 2003Bo25 (continued)

¹⁵⁷Gd Levels (continued)

E(level) [†]	J ^π [‡]	Comments
1478.0 15	(1/2 ⁺ ,3/2 ⁺)	
1489.3 15	(1/2,3/2)	
1522.0 15	(1/2,3/2)	
1527.3 15	(1/2,3/2)	
1536.4 15	(1/2,3/2) ⁺	
1568.3 15	(1/2 ⁺ ,3/2 ⁺)	
1590.5 15	(1/2,3/2)	
1615.4 15	(1/2,3/2) ⁻	
1638.6 15	(1/2,3/2)	
1659.1 15	(1/2,3/2) ⁻	
1668.1 15	(1/2 ⁻ ,3/2 ⁻)	
1694.4 15	(1/2 ⁺ ,3/2 ⁺)	
1706.8 15	(1/2,3/2) ⁺	
1718.3 15	(1/2,3/2) ⁻	
1738.4 15	(1/2,3/2) ⁻	
1752.3 15	(1/2,3/2)	
1766.4 15	(1/2 ⁺ ,3/2 ⁺)	
1798.8 15	(1/2,3/2) ⁻	
1824.9 15	(1/2,3/2)	
1846.4 15	(1/2,3/2)	
1854.9 15	(1/2,3/2)	
1863.9 15	(1/2,3/2)	
(S(n)+x)	1/2 ⁺	E(level): S(n)=6359.86 15 (from mass evaluation 2012Wa38) and x is the resonance energy which varies from 0.03 to 1.14 keV.

[†] From least-squares fit to E_γ's.

[‡] From authors (2003Bo25); significant difference with the assignments in Adopted Levels are noted.

Band(A): ν3/2[521].

@ Band(B): ν5/2[642].

& Band(C): ν5/2[523].

^a Band(D): ν1/2[521].

^b Band(E): ν3/2[402].

^c Band(F): ν1/2[400].

^d Band(G): ν3/2[651].

^e Band(H): ν3/2[532].

^f Band(I): ν1/2[530].

γ(¹⁵⁷Gd)

E _γ ^{†‡}	I _γ [#]	E _i (level)	J _i ^π	E _f	J _f ^π	E _γ ^{†‡}	I _γ [#]	E _i (level)	J _i ^π	E _f	J _f ^π
76.82 16	9.6 17	131.71	7/2 ⁻	54.64	5/2 ⁻	^x 302.4 6	2.2 11				
131.89 15	4.2 6	131.71	7/2 ⁻	0.0	3/2 ⁻	^x 309.1 3	7.0 11				
161.8 5	1.7 4	686.70	5/2 ⁺	524.87	5/2 ⁺	318.89 17	44.8 17	434.58	5/2 ⁻	115.66	7/2 ⁺
172.6 3	2.6 6	227.2	9/2 ⁻	54.64	5/2 ⁻	327.9 3	3.4 13	762.76	3/2 ⁻	434.58	5/2 ⁻
208.23 12	52.0 10	682.99	1/2 ⁺	474.75	3/2 ⁺	334.36 21	10.8 16	809.16	3/2 ⁻	474.75	3/2 ⁺
211.5 5	1.9 6	686.70	5/2 ⁺	474.75	3/2 ⁺	339.6 3	7.2 16	814.27	5/2 ⁻	474.75	3/2 ⁺
227.2 4	3.4 8	751.61	3/2 ⁺	524.87	5/2 ⁺	359.1 & 4	4.7 & 13	474.75	3/2 ⁺	115.66	7/2 ⁺
238.13 23	4.6 10	762.76	3/2 ⁻	524.87	5/2 ⁺	359.1 & a 4	4.7 & 13	793.73	1/2 ⁻	434.58	5/2 ⁻
284.09 23	6.0 13	809.16	3/2 ⁻	524.87	5/2 ⁺	370.55 16	100 2	434.58	5/2 ⁻	63.97	5/2 ⁺
288.22 17	16.0 13	762.76	3/2 ⁻	474.75	3/2 ⁺	393.0 3	6.2 14	524.87	5/2 ⁺	131.71	7/2 ⁻

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¹⁵⁶Gd(n,γ) E=resonance 2003Bo25 (continued)

γ(¹⁵⁷Gd) (continued)

<u>E_γ †‡</u>	<u>I_γ #</u>	<u>E_i(level)</u>	<u>J_i^π</u>	<u>E_f</u>	<u>J_f^π</u>	<u>Comments</u>
399.50 21	10.1 19	515.07	7/2 ⁻	115.66	7/2 ⁺	
409.00 15	95 3	524.87	5/2 ⁺	115.66	7/2 ⁺	
410.69 15	350 3	474.75	3/2 ⁺	63.97	5/2 ⁺	
^x 413.35 23	9.5 20					
420.24 18	18.6 20	474.75	3/2 ⁺	54.64	5/2 ⁻	
427.43 16	27.1 20	607.6	7/2 ⁺	180.2	9/2 ⁺	
451.00 21	12.0 20	515.07	7/2 ⁻	63.97	5/2 ⁺	
461.18 13	34.6 23	524.87	5/2 ⁺	63.97	5/2 ⁺	
^x 470.9 3	7.7 22					
474.87 13	45.3 23	474.75	3/2 ⁺	0.0	3/2 ⁻	
491.98 24	11.3 22	607.6	7/2 ⁺	115.66	7/2 ⁺	
^x 515.7 3	10.0 24					
524.7 3	7.0 21	524.87	5/2 ⁺	0.0	3/2 ⁻	
559.3 ^a 4	7.6 20	1247.0	(1/2,3/2) ⁺	686.70	5/2 ⁺	
567.23 23	17 3	683.15	3/2 ⁺	115.66	7/2 ⁺	
571.18 10	50 3	686.70	5/2 ⁺	115.66	7/2 ⁺	
591.1 6	6.1 21	771.3	7/2 ⁺	180.2	9/2 ⁺	
^x 608.21 24	10.2 23					
615.3 ^a 3	16 3	1049.9	5/2,(7/2)	434.58	5/2 ⁻	
619.21 8	217 4	683.15	3/2 ⁺	63.97	5/2 ⁺	
622.55 12	34 3	686.70	5/2 ⁺	63.97	5/2 ⁺	
^x 656.99 12	33 3					
674.82 8	133 4	729.42	3/2 ⁻	54.64	5/2 ⁻	
683.02 14	27 3	682.99	1/2 ⁺	0.0	3/2 ⁻	
687.62 8	100 4	751.61	3/2 ⁺	63.97	5/2 ⁺	
698.59 16	26 3	814.27	5/2 ⁻	115.66	7/2 ⁺	
701.54 7	184 4	701.54	1/2 ⁻	0.0	3/2 ⁻	
722.47 ^a 19	17 3	1247.0	(1/2,3/2) ⁺	524.87	5/2 ⁺	
729.38 8	70 4	729.42	3/2 ⁻	0.0	3/2 ⁻	
734.04 12	31 4	788.69	5/2 ⁻	54.64	5/2 ⁻	
738.8 4	7 3	793.73	1/2 ⁻	54.64	5/2 ⁻	
^x 751.19 16	32 4					
754.51 8	88 4	809.16	3/2 ⁻	54.64	5/2 ⁻	
762.71 7	86 4	762.76	3/2 ⁻	0.0	3/2 ⁻	
793.74 8	70 4	793.73	1/2 ⁻	0.0	3/2 ⁻	
809.37 23	14 4	809.16	3/2 ⁻	0.0	3/2 ⁻	
4495.9 15	0.6 [@] 3	(S(n)+x)	1/2 ⁺			
4504.9 15	0.4 [@] 3	(S(n)+x)	1/2 ⁺			
4513.4 15	0.3 [@] 3	(S(n)+x)	1/2 ⁺			
4534.9 15	0.49 [@] 21	(S(n)+x)	1/2 ⁺			
4561.0 15	1.3 [@] 3	(S(n)+x)	1/2 ⁺			
4593.4 15	0.13 [@] 18	(S(n)+x)	1/2 ⁺			
4607.5 15	0.8 [@] 3	(S(n)+x)	1/2 ⁺			
4621.4 15	1.4 [@] 3	(S(n)+x)	1/2 ⁺			
4641.5 15	1.2 [@] 3	(S(n)+x)	1/2 ⁺			
4653.0 15	[@]	(S(n)+x)	1/2 ⁺			
4665.4 15	0.018 [@] 15	(S(n)+x)	1/2 ⁺			
4691.7 15	1.00 [@] 23	(S(n)+x)	1/2 ⁺			
4700.7 15	1.03 [@] 25	(S(n)+x)	1/2 ⁺			
4721.2 15	0.24 [@] 15	(S(n)+x)	1/2 ⁺			
4744.4 15	1.13 [@] 25	(S(n)+x)	1/2 ⁺			
4769.3 15	0.62 [@] 18	(S(n)+x)	1/2 ⁺			

I_γ: authors' value is negative, -0.074 15.

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$^{156}\text{Gd}(n,\gamma)$ E=resonance 2003Bo25 (continued) $\gamma(^{157}\text{Gd})$ (continued)

E_γ †‡	I_γ #	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Comments
4791.5	15 0.10 @ 13	(S(n)+x)	1/2 ⁺			
4823.4	15 0.04 @ 12	(S(n)+x)	1/2 ⁺			
4832.5	15 0.42 @ 15	(S(n)+x)	1/2 ⁺			
4837.8	15 0.71 @ 18	(S(n)+x)	1/2 ⁺			
4870.5	15 0.32 @ 13	(S(n)+x)	1/2 ⁺			
4881.8	15 0.16 @ 12	(S(n)+x)	1/2 ⁺			
4946.2	15 0.73 @ 17	(S(n)+x)	1/2 ⁺			
4972.8	15 0.40 @ 12	(S(n)+x)	1/2 ⁺			
5009.7	15 1.4 @ 3	(S(n)+x)	1/2 ⁺	1846.4	(1/2,3/2)	
5026.1	15 0.22 @ 10	(S(n)+x)	1/2 ⁺			
5042.9	15 0.77 @ 17	(S(n)+x)	1/2 ⁺	1824.9	(1/2,3/2)	
5062.4	15 0.24 @ 10	(S(n)+x)	1/2 ⁺	1798.8	(1/2,3/2) ⁻	
5074.1	15 0.29 @ 10	(S(n)+x)	1/2 ⁺			
5112.8	15 @	(S(n)+x)	1/2 ⁺	1752.3	(1/2,3/2)	I_γ : authors' value is negative, -0.06 8.
5121.8	15 0.15 @ 9	(S(n)+x)	1/2 ⁺	1738.4	(1/2,3/2) ⁻	
5193.1	15 0.13 @ 8	(S(n)+x)	1/2 ⁺	1668.1	(1/2 ⁻ ,3/2 ⁻)	
5201.9	15 0.12 @ 8	(S(n)+x)	1/2 ⁺	1659.1	(1/2,3/2) ⁻	
5251.6	15 0.18 @ 8	(S(n)+x)	1/2 ⁺	1615.4	(1/2,3/2) ⁻	
5266.8	15 0.10 @ 7	(S(n)+x)	1/2 ⁺	1590.5	(1/2,3/2)	
5318.1	5 1.06 @ 21	(S(n)+x)	1/2 ⁺	1536.4	(1/2,3/2) ⁺	
5386.0	5 0.11 @ 6	(S(n)+x)	1/2 ⁺	1478.0	(1/2 ⁺ ,3/2 ⁺)	
5422.7	5 0.11 @ 6	(S(n)+x)	1/2 ⁺			
5550.4	5 1.5 @ 3	(S(n)+x)	1/2 ⁺	1316.9	(1/2 ⁻ ,3/2 ⁻)	
5565.9	5 1.29 @ 24	(S(n)+x)	1/2 ⁺	1297.4	(1/2,3/2)	
5596.9	5 0.85 @ 16	(S(n)+x)	1/2 ⁺			
5608.3	5 0.14 @ 5	(S(n)+x)	1/2 ⁺	1247.0	(1/2,3/2) ⁺	
5630.7	5 0.58 @ 12	(S(n)+x)	1/2 ⁺	1238.0	(1/2,3/2) ⁺	
5658.3	5 0.95 @ 18	(S(n)+x)	1/2 ⁺			
5676.8	5 0.33 @ 7	(S(n)+x)	1/2 ⁺			
5886.0	5 0.18 @ 5	(S(n)+x)	1/2 ⁺	973.8	(1/2,3/2) ⁺	
6295.9	5 0.028 @ 22	(S(n)+x)	1/2 ⁺			
6360.0	5 0.87 @ 16	(S(n)+x)	1/2 ⁺			

† Although 2003Bo25 indicate that their primary γ energies have been recoil corrected, a subsequent communication indicates they were not recoil corrected.

‡ The uncertainties in the E_γ are assigned as 0.5 keV for $E_\gamma > 5300$, and 1.5 keV for $E_\gamma < 5000$, based on a general statement by authors.

Relative intensities are given for secondary γ 's (those below 1 MeV) for capture in the 33 eV resonance and reduced (i.e., I_γ/E_γ^5) resonance-averaged (average over 16 resonances) intensities are given for primary transitions (those above 4 MeV).

@ Normalized reduced (i.e., I_γ/E_γ^5) resonance-averaged intensities.

& Multiply placed with intensity suitably divided.

^a Placement of transition in the level scheme is uncertain.

^x γ ray not placed in level scheme.

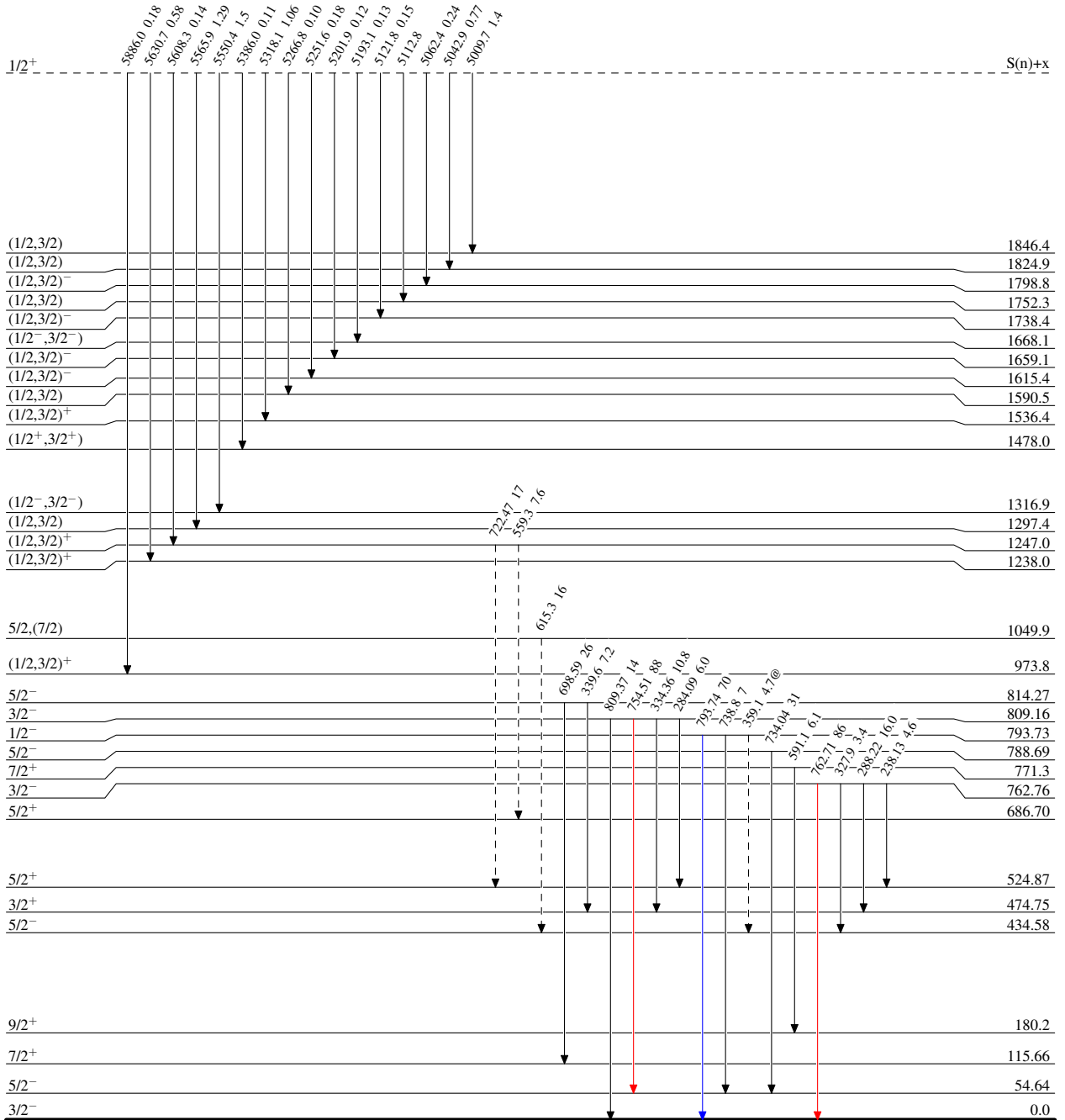
$^{156}\text{Gd}(n,\gamma) E=\text{resonance}$ 2003Bo25

Level Scheme

Intensities: Relative I_γ
@ Multiply placed: intensity suitably divided

Legend

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



$^{157}_{64}\text{Gd}_{93}$

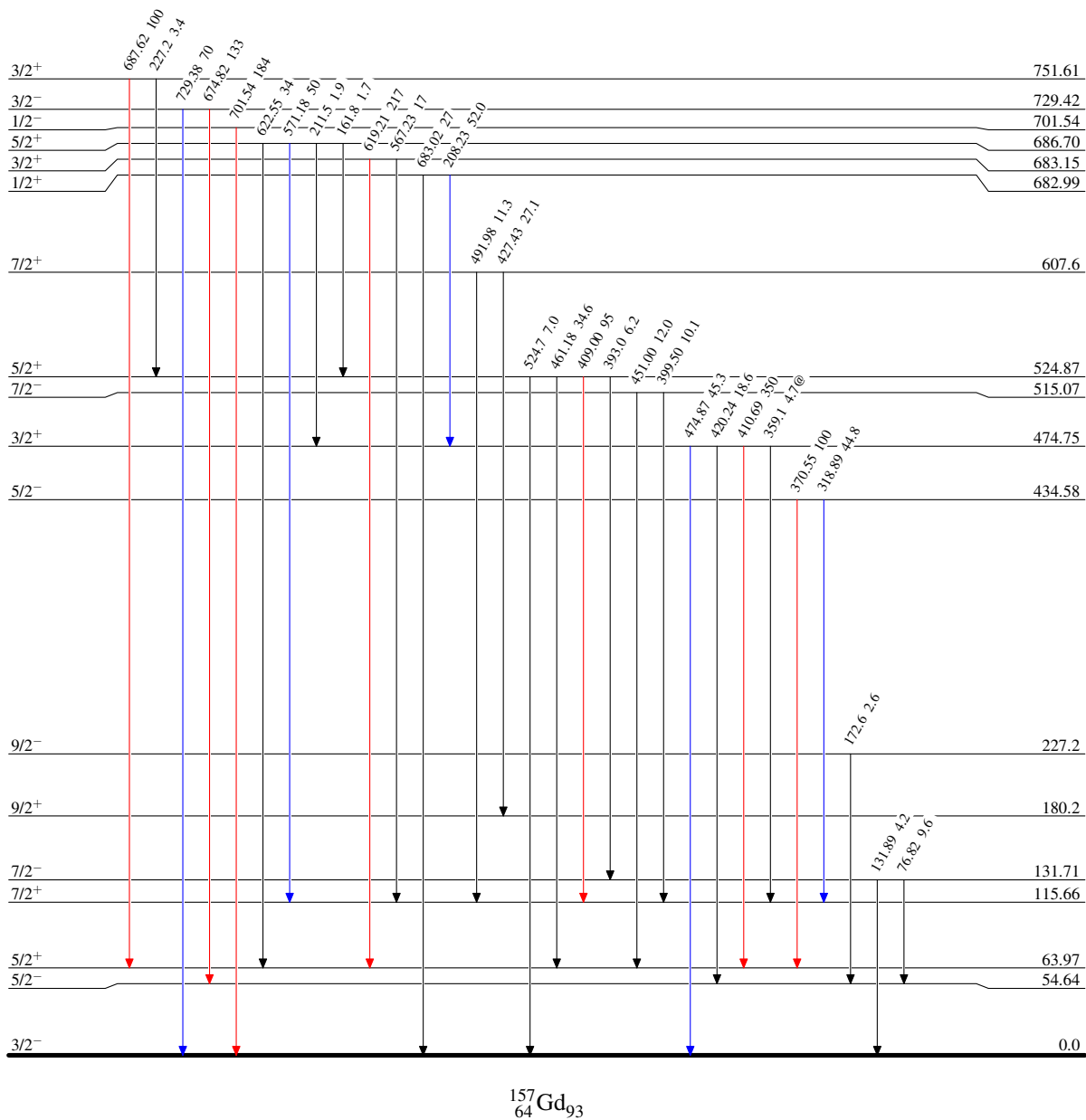
$^{156}\text{Gd}(n,\gamma)$ E=resonance 2003Bo25

Level Scheme (continued)

Legend

Intensities: Relative I_γ
 @ Multiply placed: intensity suitably divided

→ $I_\gamma < 2\% \times I_\gamma^{max}$
 → $I_\gamma < 10\% \times I_\gamma^{max}$
 → $I_\gamma > 10\% \times I_\gamma^{max}$



 $^{156}\text{Gd}(n,\gamma)$ E=resonance 2003Bo25 (continued)Band(H): $\nu 3/2[532]$ $\underline{5/2^-} \quad \underline{814.27}$ Band(I): $\nu 1/2[530]$ $\underline{3/2^-} \quad \underline{809.16}$ $\underline{1/2^-} \quad \underline{793.73}$ Band(G): $\nu 3/2[651]$ $\underline{7/2^+} \quad \underline{771.3}$ $\underline{3/2^-} \quad \underline{762.76}$ $\underline{5/2^+} \quad \underline{686.70}$ $\underline{3/2^+} \quad \underline{683.15}$ $^{157}_{64}\text{Gd}_{93}$