

$^{156}\text{Gd}(^{23}\text{Na},4n\gamma)$ [1992Ji03](#)

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	M. Shamsuzzoha Basunia	NDS 102, 719 (2004)		1-Jun-2004

Target: ^{156}Gd . Projectile: ^{23}Na , E=111 MeV. Measured $E\gamma$, $\gamma\gamma$ coin, $\gamma\gamma(\theta)$, DCO ratios. Detector: An array of 20 Compton-suppressed germanium detectors.

 ^{175}Re Levels

The level energies of the 9/2[514] rotational band are relative to the adopted value of 76.4 keV for the $J^\pi=9/2^-$ bandhead.

E(level)	J^π	Comments
0.0 ‡	5/2 $^-$	E(level): From Adopted Levels. In 1992Ji03 , it is presented as a (0.0+X) level.
75 ‡	9/2 $^-$	
(76.4) a	9/2 $^-$	
124.3 $^{\&}$	5/2 $^+$	
237.1 a	11/2 $^-$	
239.1 $^{\&}$	7/2 $^+$	
271.9 ‡	13/2 $^-$	
360.9 $^@$	7/2 $^+$	
377.2 $^{\&}$	9/2 $^+$	
428.2 a	13/2 $^-$	
488.8 $^@$	9/2 $^+$	
536.0 $^{\&}$	11/2 $^+$	
587.4 ‡	17/2 $^-$	
638.4 $^@$	11/2 $^+$	
638.7 a	15/2 $^-$	
709.7 $^{\&}$	13/2 $^+$	
807.5 $^@$	13/2 $^+$	
869.5 a	17/2 $^-$	
899.4 $^{\&}$	15/2 $^+$	
995.1 $^@$	15/2 $^+$	
1008.7 ‡	21/2 $^-$	
1100.5 $^{\&}$	17/2 $^+$	
1110.4 a	19/2 $^-$	
1198.4 $^@$	17/2 $^+$	
1317.1 $^{\&}$	19/2 $^+$	
1324.9 $^{\#}$	17/2 $^+$	
1366.0 a	21/2 $^-$	
1418.6 $^@$	19/2 $^+$	
1520.4 ‡	25/2 $^-$	
1544.2 $^{\&}$	21/2 $^+$	
1617.6 $^{\#}$	21/2 $^+$	
1626.5 a	23/2 $^-$	
1655.5 $^@$	21/2 $^+$	
1788.2 $^{\&}$	23/2 $^+$	
1899.0 $^@$	23/2 $^+$	
1899.8 a	25/2 $^-$	

Continued on next page (footnotes at end of table)

$^{156}\text{Gd}(^{23}\text{Na},4n\gamma)$ 1992Ji03 (continued) ^{175}Re Levels (continued)

E(level)	$J^\pi^\dagger$	Comments
1992.8 [#]	25/2 ⁺	
2044.2 ^{&}	25/2 ⁺	
2106.1 [‡]	29/2 ⁻	
2169 [@]	25/2 ⁺	
2178.5 ^a	27/2 ⁻	
2306.7 ^{&}	27/2 ⁺	
2434 [@]	(27/2 ⁺)	
2441.4 [#]	29/2 ⁺	
2469.4 ^a	29/2 ⁻	
2578.7 ^{&}	29/2 ⁺	Level not adopted, because both 272.1 γ and 534.5 γ depopulating this level are lower by about 20 keV than as observed in $^{161}\text{Dy}(^{19}\text{F},5n\gamma)$ and resulted different level energy for the 29/2 ⁺ state.
2721? [@]	29/2 ⁺	
2740.2 [‡]	33/2 ⁻	
2764.1 ^a	31/2 ⁻	
2858.6 ^{&}	31/2 ⁺	Level not adopted, because depopulating 280 γ feeding to the 29/2 ⁺ state, whose energy level disagrees by about 20 keV with the $^{161}\text{Dy}(^{19}\text{F},5n\gamma)$ dataset not adopted.
2952.5 [#]	33/2 ⁺	
3005? [@]	(31/2 ⁺)	
3044.2 ^a	33/2 ⁻	
3278.4 ^a	35/2 ⁻	
3374.3 [‡]	37/2 ⁻	
3522.0 [#]	37/2 ⁺	
3525 ^a	37/2 ⁻	
3799.4 ^a	39/2 ⁻	
4002.6 [‡]	41/2 ⁻	
4096 ^a	41/2 ⁻	
4147.0 [#]	41/2 ⁺	
4417.4 ^a	43/2 ⁻	
4678.9 [‡]	45/2 ⁻	
4760 ^a	45/2 ⁻	
4824.8 [#]	45/2 ⁺	
5121.4 ^a	47/2 ⁻	
5418 [‡]	49/2 ⁻	
5553 [#]	49/2 ⁺	
6221? [‡]	53/2 ⁻	
6320 [#]	53/2 ⁺	

[†] Spin and parity assignments are based on rotational structure, γ -ray multipolarities (not reported) deduced from DCO ratios and systematics of rotational band properties in neighboring nuclei. The 5/2[402] and 7/2[404] rotational bands have been interpreted as members of a pseudo-spin doublet mixed by the Coriolis interaction. This interpretation explains the strong γ -ray transitions between the two rotational bands.

[‡] 1/2(541) band.

[#] 1/2(660) band.

[@] 7/2(404) band.

[&] 5/2(402) band.

^a 9/2(514) band.

$^{156}\text{Gd}(^{23}\text{Na},4n\gamma)$ **1992Ji03** (continued) $\gamma(^{175}\text{Re})$

E_γ	$E_i(\text{level})$	J_i^π	E_f	J_f^π	E_γ	I_γ	$E_i(\text{level})$	J_i^π	E_f	J_f^π
(75)	75	9/2 ⁻	0.0	5/2 ⁻	332.3		709.7	13/2 ⁺	377.2	9/2 ⁺
(76.4)	(76.4)	9/2 ⁻	0.0	5/2 ⁻	338		1655.5	21/2 ⁺	1317.1	19/2 ⁺
114.8	239.1	7/2 ⁺	124.3	5/2 ⁺	344 [†]		4760	45/2 ⁻	4417.4	43/2 ⁻
(124.3)	124.3	5/2 ⁺	0.0	5/2 ⁻	351.8		428.2	13/2 ⁻	76.4?	9/2 ⁻
127.8	488.8	9/2 ⁺	360.9	7/2 ⁺	356.7		995.1	15/2 ⁺	638.4	11/2 ⁺
138.1	377.2	9/2 ⁺	239.1	7/2 ⁺	360 [†]		5121.4	47/2 ⁻	4760	45/2 ⁻
149.7	638.4	11/2 ⁺	488.8	9/2 ⁺	363.2		899.4	15/2 ⁺	536.0	11/2 ⁺
158.8	536.0	11/2 ⁺	377.2	9/2 ⁺	375.2		1992.8	25/2 ⁺	1617.6	21/2 ⁺
160.7	237.1	11/2 ⁻	76.4?	9/2 ⁻	390.8		1100.5	17/2 ⁺	709.7	13/2 ⁺
169.0	807.5	13/2 ⁺	638.4	11/2 ⁺	390.9	73 10	1198.4	17/2 ⁺	807.5	13/2 ⁺
173.7	709.7	13/2 ⁺	536.0	11/2 ⁺	401.6		638.7	15/2 ⁻	237.1	11/2 ⁻
187.6	995.1	15/2 ⁺	807.5	13/2 ⁺	417.7		1317.1	19/2 ⁺	899.4	15/2 ⁺
189.7	899.4	15/2 ⁺	709.7	13/2 ⁺	419.1		1617.6	21/2 ⁺	1198.4	17/2 ⁺
191.3	428.2	13/2 ⁻	237.1	11/2 ⁻	421.3		1008.7	21/2 ⁻	587.4	17/2 ⁻
196.9	271.9	13/2 ⁻	75	9/2 ⁻	423.5		1418.6	19/2 ⁺	995.1	15/2 ⁺
201.1	1100.5	17/2 ⁺	899.4	15/2 ⁺	441.3		869.5	17/2 ⁻	428.2	13/2 ⁻
203.3	1198.4	17/2 ⁺	995.1	15/2 ⁺	443.7		1544.2	21/2 ⁺	1100.5	17/2 ⁺
210.4	638.7	15/2 ⁻	428.2	13/2 ⁻	448.6		1992.8	25/2 ⁺	1544.2	21/2 ⁺
216.6	1317.1	19/2 ⁺	1100.5	17/2 ⁺	448.6		2441.4	29/2 ⁺	1992.8	25/2 ⁺
220.0	1418.6	19/2 ⁺	1198.4	17/2 ⁺	457.1		1655.5	21/2 ⁺	1198.4	17/2 ⁺
227.0	1544.2	21/2 ⁺	1317.1	19/2 ⁺	471.1		1788.2	23/2 ⁺	1317.1	19/2 ⁺
231.1	869.5	17/2 ⁻	638.7	15/2 ⁻	471.7		1110.4	19/2 ⁻	638.7	15/2 ⁻
234	3278.4	35/2 ⁻	3044.2	33/2 ⁻	480.4		1899.0	23/2 ⁺	1418.6	19/2 ⁺
236.6	360.9	7/2 ⁺	124.3	5/2 ⁺	481		3525	37/2 ⁻	3044.2	33/2 ⁻
236.7	1655.5	21/2 ⁺	1418.6	19/2 ⁺	496.5		1366.0	21/2 ⁻	869.5	17/2 ⁻
240.6	1110.4	19/2 ⁻	869.5	17/2 ⁻	500.0		2044.2	25/2 ⁺	1544.2	21/2 ⁺
243.5	1899.0	23/2 ⁺	1655.5	21/2 ⁺	511.1		2952.5	33/2 ⁺	2441.4	29/2 ⁺
244.0	1788.2	23/2 ⁺	1544.2	21/2 ⁺	511.7		1520.4	25/2 ⁻	1008.7	21/2 ⁻
247.6	3525	37/2 ⁻	3278.4	35/2 ⁻	513.5		2169	25/2 ⁺	1655.5	21/2 ⁺
249.7	488.8	9/2 ⁺	239.1	7/2 ⁺	514		3278.4	35/2 ⁻	2764.1	31/2 ⁻
252.6	377.2	9/2 ⁺	124.3	5/2 ⁺	516.1		1626.5	23/2 ⁻	1110.4	19/2 ⁻
255.9	1366.0	21/2 ⁻	1110.4	19/2 ⁻	518.5		2306.7	27/2 ⁺	1788.2	23/2 ⁺
256.0	2044.2	25/2 ⁺	1788.2	23/2 ⁺	521		3799.4	39/2 ⁻	3278.4	35/2 ⁻
260.3	1626.5	23/2 ⁻	1366.0	21/2 ⁻	533.8		1899.8	25/2 ⁻	1366.0	21/2 ⁻
261.2	638.4	11/2 ⁺	377.2	9/2 ⁺	534.5		2578.7	29/2 ⁺	2044.2	25/2 ⁺
262.5	2306.7	27/2 ⁺	2044.2	25/2 ⁺	535		2434	(27/2 ⁺)	1899.0	23/2 ⁺
271.4	807.5	13/2 ⁺	536.0	11/2 ⁺	551.9		2858.6	31/2 ⁺	2306.7	27/2 ⁺
272.1	2578.7	29/2 ⁺	2306.7	27/2 ⁺	552.0		2178.5	27/2 ⁻	1626.5	23/2 ⁻
273.6	1899.8	25/2 ⁻	1626.5	23/2 ⁻	552 [†]		2721?	29/2 ⁺	2169	25/2 ⁺
273.8	3799.4	39/2 ⁻	3525	37/2 ⁻	569.5		3522.0	37/2 ⁺	2952.5	33/2 ⁺
277.5	638.4	11/2 ⁺	360.9	7/2 ⁺	569.6		2469.4	29/2 ⁻	1899.8	25/2 ⁻
278.5	2178.5	27/2 ⁻	1899.8	25/2 ⁻	571 [†]		3005?	(31/2 ⁺)	2434	(27/2 ⁺)
280	2858.6	31/2 ⁺	2578.7	29/2 ⁺	571		4096	41/2 ⁻	3525	37/2 ⁻
280.4	3044.2	33/2 ⁻	2764.1	31/2 ⁻	574.8		3044.2	33/2 ⁻	2469.4	29/2 ⁻
285.3	995.1	15/2 ⁺	709.7	13/2 ⁺	585.6		2764.1	31/2 ⁻	2178.5	27/2 ⁻
291.3	2469.4	29/2 ⁻	2178.5	27/2 ⁻	585.7		2106.1	29/2 ⁻	1520.4	25/2 ⁻
292.7	1617.6	21/2 ⁺	1324.9	17/2 ⁺	608.9		1617.6	21/2 ⁺	1008.7	21/2 ⁻
294.4	2764.1	31/2 ⁻	2469.4	29/2 ⁻	618		4417.4	43/2 ⁻	3799.4	39/2 ⁻
296.9	536.0	11/2 ⁺	239.1	7/2 ⁺	625.0		4147.0	41/2 ⁺	3522.0	37/2 ⁺
297	4096	41/2 ⁻	3799.4	39/2 ⁻	628.3		4002.6	41/2 ⁻	3374.3	37/2 ⁻
299.2	1198.4	17/2 ⁺	899.4	15/2 ⁺	633.3	112 14	3374.3	37/2 ⁻	2740.2	33/2 ⁻
315.5	587.4	17/2 ⁻	271.9	13/2 ⁻	634.1		2740.2	33/2 ⁻	2106.1	29/2 ⁻
318	1418.6	19/2 ⁺	1100.5	17/2 ⁺	664		4760	45/2 ⁻	4096	41/2 ⁻
318.7	807.5	13/2 ⁺	488.8	9/2 ⁺	676.3		4678.9	45/2 ⁻	4002.6	41/2 ⁻
321.0	4417.4	43/2 ⁻	4096	41/2 ⁻	677.8		4824.8	45/2 ⁺	4147.0	41/2 ⁺

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 $^{156}\text{Gd}(^{23}\text{Na},4n\gamma)$ **1992Ji03 (continued)**

 $\gamma(^{175}\text{Re})$ (continued)

<u>E_γ</u>	<u>$E_i(\text{level})$</u>	<u>J^π_i</u>	<u>E_f</u>	<u>J^π_f</u>
704	5121.4	47/2 ⁻	4417.4	43/2 ⁻
728	5553	49/2 ⁺	4824.8	45/2 ⁺
737.4	1324.9	17/2 ⁺	587.4	17/2 ⁻
739	5418	49/2 ⁻	4678.9	45/2 ⁻
767	6320	53/2 ⁺	5553	49/2 ⁺
803 [†]	6221?	53/2 ⁻	5418	49/2 ⁻

[†] Placement of transition in the level scheme is uncertain.

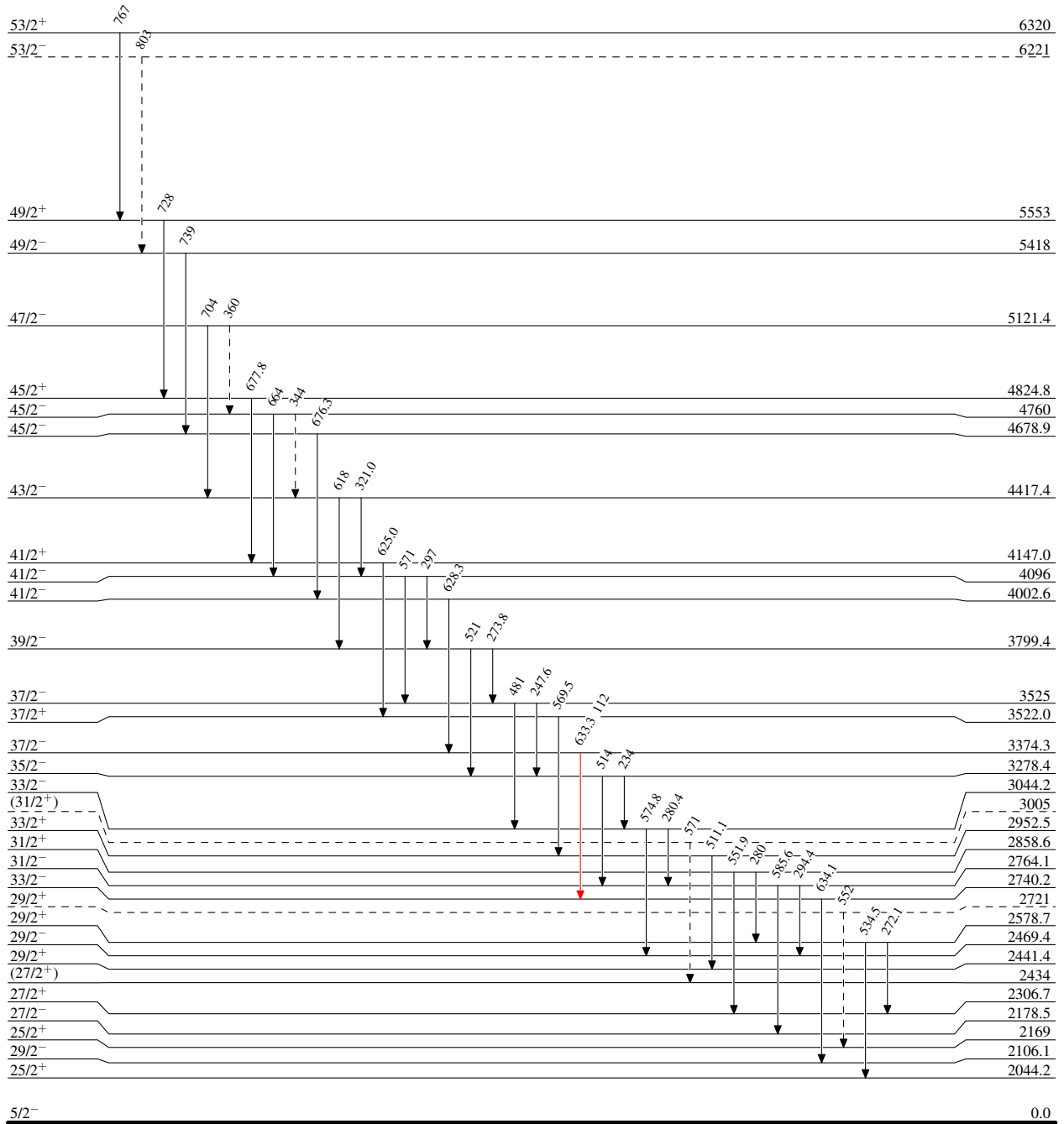
$^{156}\text{Gd}(^{23}\text{Na},4n\gamma)$ 1992Ji03

Legend

Level Scheme

Intensities: Type not specified

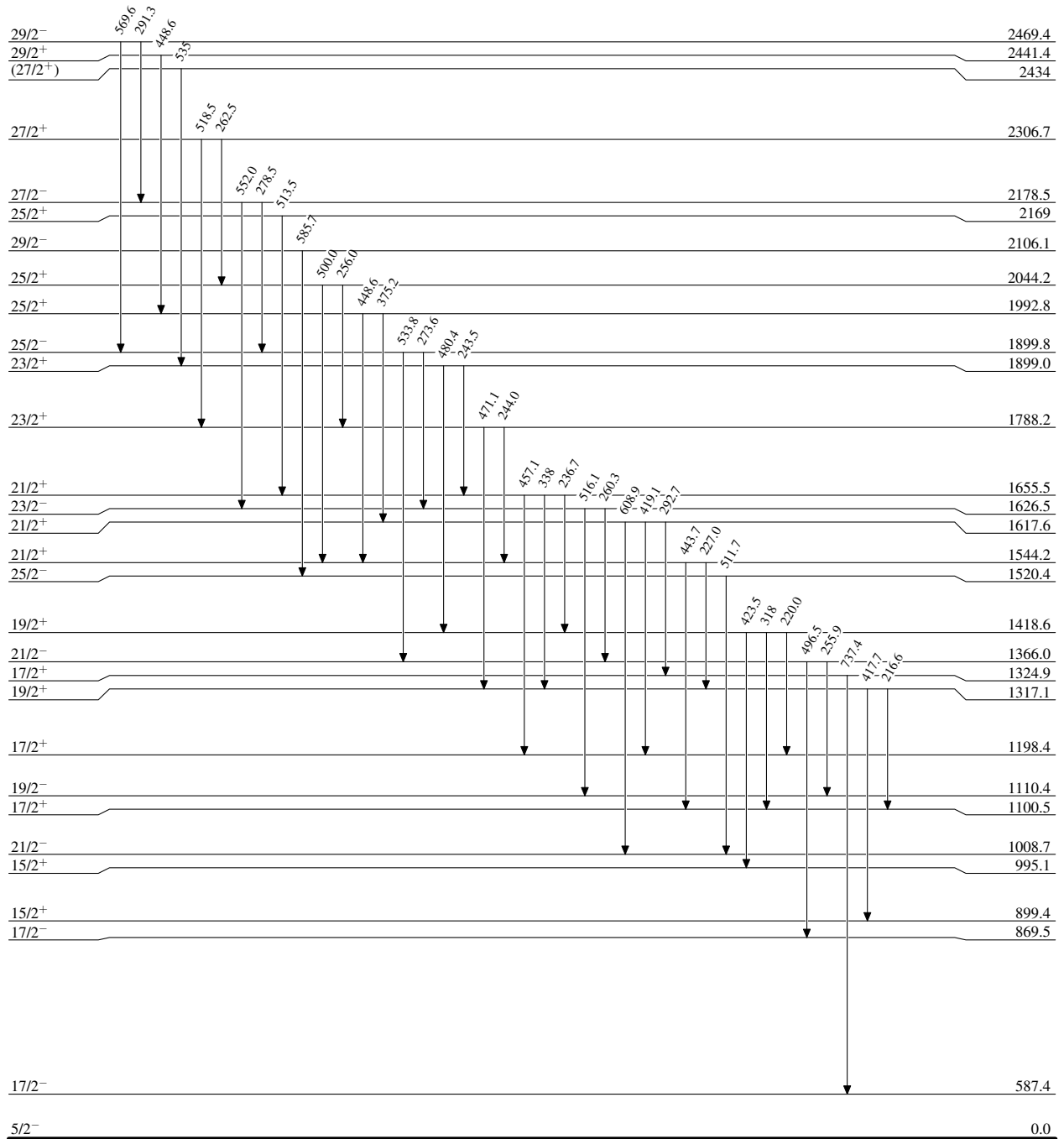
- $I_\gamma < 2\% \times I_\gamma^{\max}$
 —————→ $I_\gamma < 10\% \times I_\gamma^{\max}$
 —————→ $I_\gamma > 10\% \times I_\gamma^{\max}$
 - - - - -→ γ Decay (Uncertain)



$^{156}\text{Gd}(^{23}\text{Na},4n\gamma)$ 1992Ji03

Level Scheme (continued)

Intensities: Type not specified

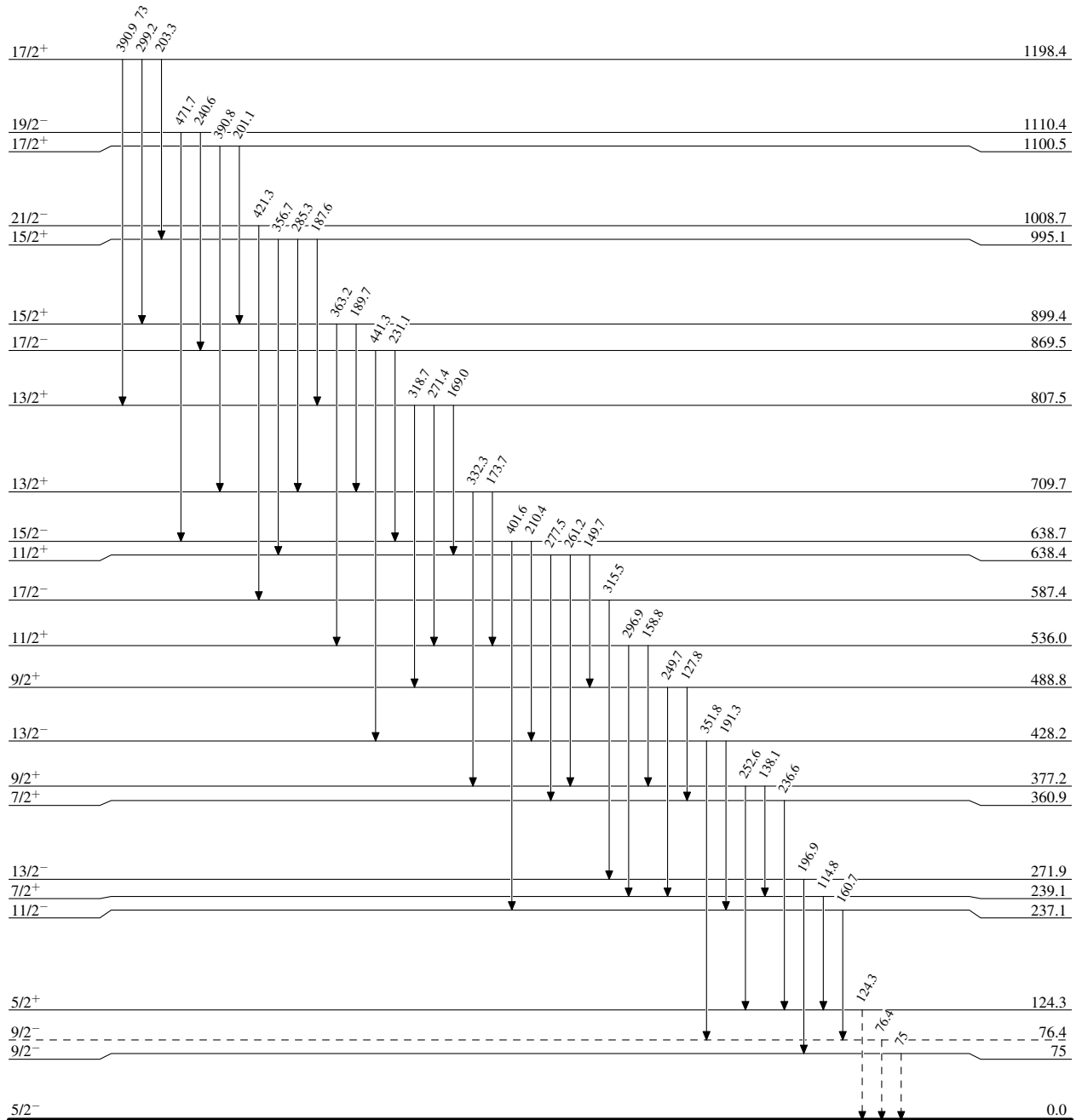


$^{156}\text{Gd}(^{23}\text{Na},4n\gamma)$ 1992Ji03

Legend

Level Scheme (continued)

Intensities: Type not specified

-----► γ Decay (Uncertain) $^{175}_{75}\text{Re}_{100}$