^{168}Er(n,γ) E=thermal 1970Mu15

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Coral M. Baglin	NDS 109, 2033 (2008)	15-Jun-2008

σ_n=2.74 *8* (2006MuZX). % abundance(^{168}Er)=26.78 *26*.
Others: 2007ChZX (supersedes 2003ChZS), 1966Ko03.
1970Mu15; Er oxide targets enriched to 99.987% in ^{168}Er; measured Eγ, Iγ for primary and secondary transitions; Si(Li), FWHM=0.45 keV at 25 keV, 0.75 keV at 100 keV; Ge(Li) (singly and in pair mode), FWHM≈3 keV at 500 keV,≈7 keV at 6 MeV.

^{169}Er Levels

E(level)[†]	J$^\pi$[‡]	E(level)[†]	J$^\pi$[‡]	E(level)[†]	J$^\pi$[‡]
0.0	$1/2^-$	1142.8 *6*	1/2,3/2	1867.2 *9*	$1/2^{(-)}$,$3/2^{(-)}$
64.55 *2*	$3/2^-$	1145.4 *3*	$(5/2^-)$	1897.7 *8*	1/2,3/2
74.56 *7*	$5/2^-$	1360.1 *4*	$1/2^{(+)}$	1928.8 *8*	$1/2^-$,$3/2^-$
92.13 *12*	$(5/2)^-$	1386.87 *16*	$1/2^-$,$3/2^-$	1948.0 *15*	$1/2^-$,$3/2^-$
177.03 *16*	$(7/2)^-$	1470.7 *8*	$1/2^{(-)}$,$3/2^{(-)}$	1955.3 *23*	$1/2^-$,$3/2^-$
224.14 *9*	$7/2^-$	1483.9 *18*	1/2,3/2	1978.9 *8*	1/2,3/2
241.96 *12*	$9/2^-$	1488.0 *12*	$1/2^-$,$3/2^-$	1997.0 *8*	1/2,3/2
243.57 *21*	$7/2^+$	1529.6 *8*	$1/2^-$,$3/2^-$	2029.3 *9*	$1/2^-$,$3/2^-$
285.4 *3*	$(9/2^-)$	1553.7 *7*	$1/2^-$,$3/2^-$	2047.1 *14*	1/2,3/2
562.04 *9*	$(1/2)^-$	1647.2 *7*	$(1/2^+)$	2063.0 *9*	1/2,3/2
599.31 *9*	$(3/2)^-$	1667.5 *17*	1/2,3/2	2112.5 *10*	1/2,3/2
654.05 *25*	$(5/2^-)$	1680.0 *10*	1/2,3/2	2125.2 *8*	$1/2^-$,$3/2^-$
714.54 *12*	$(3/2)^-$	1710.1 *8*	1/2,3/2	2141[#] *3*	$1/2^{(-)}$,$3/2^{(-)}$
739.7? *7*	$(7/2^-)$	1783.6 *8*	1/2,3/2	2165.5 *17*	$1/2^-$,$3/2^-$
769.51 *15*	$(5/2^-)$	1795.3 *10*	1/2,3/2	2180.4 *8*	$1/2^-$,$3/2^-$
853.4 *3*	$5/2^-$	1806.3 *19*	1/2,3/2	2185.2 *9*	1/2,3/2
860.10 *14*	$(3/2^+,5/2^+)$	1819.7 *18*	$1/2^{(-)}$,$3/2^{(-)}$	2219.4 *8*	1/2,3/2
1081.72 *23*	$(3/2^-)$	1826.0 *12*	1/2,3/2	2225.3 *12*	$1/2^-$,$3/2^-$
1094.36 *11*	$1/2^-$,$3/2^-$	1839.3 *9*	$1/2^{(-)}$,$3/2^{(-)}$	2237.9 *9*	1/2,3/2
1117.30 *24*	$(3/2^-)$	1848.4 *9*	$1/2^-$,$3/2^-$	(6003.17[@] *19*)	$1/2^+$[&]

[†] From least-squares fit to Eγ, omitting transitions with multiple or uncertain placements.
[‡] Adopted values, except where noted.
[#] The apparent discrepancy between Eγ=3861.9 and E(level)=2131.2 (see table 3 in 1970Mu15) is resolved if Eγ is taken as correct and E(level) changed to 2141.2. This level probably corresponds to E(level)=2139.1 in ^{168}Er(n,γ) E=res.
[@] Neutron capture state(S) cf. S(n)=6003.27 *15* (2003Au03).
[&] s-wave capture by even-even nucleus.

γ(^{169}Er)

Iγ normalization: 0.74 is deduced from σ_n=2.74 *8* (2006MuZX), and from the normalization given by 1970Mu15 (which was based on σ_n=2.03 *41*). Additional uncertainty introduced by new cross section is negligible. However, it should be noted that a normalization factor of 0.48 *9* would Be required if Σ (I(γ+ce) to g.s.)=100. Absolute elemental cross section data from 2007ChZX (Budapest measurements) are consistent with neither of these factors; they imply normalization factors that vary widely from one transition to another and are typically At least an order of magnitude larger. new measurements are called for In order to resolve these normalization discrepancies.

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^{168}Er(n,γ) E=thermal 1970Mu15 (continued)

$\gamma(^{169}Er)$ (continued)

E_γ †	I_γ ‡e	E_i(level)	J_i^π	E_f	J_f^π	Comments
27.6 *2*	1.4 *4*	92.13	$(5/2)^-$	64.55	$3/2^-$	
64.55# *2*	12.6 *25*	64.55	$3/2^-$	0.0	$1/2^-$	
74.6 *1*	2.5 *5*	74.56	$5/2^-$	0.0	$1/2^-$	
84.9 *1*	0.53 *11*	177.03	$(7/2)^-$	92.13	$(5/2)^-$	other Eγ: 84.74 *12* (2007ChZX; Budapest data).
x99.3@& *4*	0.36 *10*					
108.4 *2*	0.21 *4*	285.4	$(9/2^-)$	177.03	$(7/2)^-$	
149.6 *2*	3.7 *9*	224.14	$7/2^-$	74.56	$5/2^-$	
151.5 *2*	4.4 *11*	243.57	$7/2^+$	92.13	$(5/2)^-$	
159.59# *9*	4.1 *8*	224.14	$7/2^-$	64.55	$3/2^-$	
167.4 *1*	0.57 *12*	241.96	$9/2^-$	74.56	$5/2^-$	
x174.7 *3*	0.16 *4*					
x209.3 *3*	0.17 *4*					
x219.9 *4*	0.16 *4*					
x254.5@ *4*	0.09 *4*					
292.6 *3*	0.11 *4*	1386.87	$1/2^-,3/2^-$	1094.36	$1/2^-,3/2^-$	
x368.8@ *6*	0.28 *10*					
x422.8 *2*	0.25 *6*					
429.9f *1*	5.3f *11*	654.05	$(5/2^-)$	224.14	$7/2^-$	
429.9f *1*	5.3f *11*	1145.4	$(5/2^-)$	714.54	$(3/2)^-$	
x439.9@ *4*	0.20 *5*					
470.2 *4*	2.4 *6*	562.04	$(1/2)^-$	92.13	$(5/2)^-$	
x477.6 *5*	1.0 *4*					
497.5 *1*	8.6 *17*	562.04	$(1/2)^-$	64.55	$3/2^-$	
507.1 *2*	0.95 *22*	599.31	$(3/2)^-$	92.13	$(5/2)^-$	
524.8 *1*	2.8 *6*	599.31	$(3/2)^-$	74.56	$5/2^-$	
534.7 *2*	1.6 *3*	599.31	$(3/2)^-$	64.55	$3/2^-$	
545.0f *6*	0.27f *8*	769.51	$(5/2^-)$	224.14	$7/2^-$	
545.0f *6*	0.27f *8*	1145.4	$(5/2^-)$	599.31	$(3/2)^-$	
562.0 *2*	2.3 *5*	562.04	$(1/2)^-$	0.0	$1/2^-$	other Eγ: 563.3 *3* (2007ChZX; Budapest data).
579.3 *4*	0.17 *4*	654.05	$(5/2^-)$	74.56	$5/2^-$	
589.6 *3*	2.4 *5*	654.05	$(5/2^-)$	64.55	$3/2^-$	
599.2 *2*	3.9 *8*	599.31	$(3/2)^-$	0.0	$1/2^-$	
616.8 *4*	0.32 *9*	860.10	$(3/2^+,5/2^+)$	243.57	$7/2^+$	
622.8 *6*	0.15 *6*	714.54	$(3/2)^-$	92.13	$(5/2)^-$	other Eγ: 623.0 *6* (2007ChZX; Budapest data).
x631.5 *4*	0.27 *8*					
640.0 *2*	0.84 *18*	714.54	$(3/2)^-$	74.56	$5/2^-$	
650.0 *2*	2.7 *6*	714.54	$(3/2)^-$	64.55	$3/2^-$	
x663.0 *6*	0.64 *23*					
665.1h *7*	0.46 *22*	739.7?	$(7/2^-)$	74.56	$5/2^-$	
x682.4 *2*	1.19 *25*					
695.0 *2*	2.4 *5*	769.51	$(5/2^-)$	74.56	$5/2^-$	other Eγ: 694.6 *4* (2007ChZX; Budapest data).
704.9 *2*	2.0 *4*	769.51	$(5/2^-)$	64.55	$3/2^-$	
714.5 *2*	4.9 *10*	714.54	$(3/2)^-$	0.0	$1/2^-$	
732.2h *2*	4.3 *9*	1386.87	$1/2^-,3/2^-$	654.05	$(5/2^-)$	
x756.5 *3*	0.40 *9*					
760.7g *2*	0.48gc *9*	853.4	$5/2^-$	92.13	$(5/2)^-$	
760.7g *2*	<0.2gc	1360.1	$1/2^{(+)}$	599.31	$(3/2)^-$	
x768.0 *4*	0.75 *17*					
x772.1 *3*	1.43a *30*					
779.4 *5*	0.52 *13*	853.4	$5/2^-$	74.56	$5/2^-$	other Eγ: 779.34 *19* (2007ChZX; Budapest data).
785.4 *2*	3.5 *8*	860.10	$(3/2^+,5/2^+)$	74.56	$5/2^-$	
787.9g *3*	0.99gd *19*	853.4	$5/2^-$	64.55	$3/2^-$	

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^{168}Er(n,γ) E=thermal 1970Mu15 (continued)

$\gamma(^{169}Er)$ (continued)

E_γ †	I_γ ‡e	E_i(level)	J_i^π	E_f	J_f^π	Comments
787.9g 3	0.6gd 4	1386.87	1/2−,3/2−	599.31	(3/2)−	
795.6 2	2.5 5	860.10	(3/2+,5/2+)	64.55	3/2−	other Eγ: 795.0 3 (2007ChZX; Budapest data).
798.6 5	0.69 19	1360.1	1/2(+)	562.04	(1/2)−	
x821.7 9	0.11 6					
x823.4 2	1.11 23					
x836.7 2	1.4 3					
853.2 3	0.48 11	853.4	5/2−	0.0	1/2−	
x858.7 3	0.32 8					
x870.5 3	0.98 23					
x896.1 2	1.01 21					
x915.0 5	0.31 10					
x918.5 2	1.16 25					
x936.5 3	0.55 12					
939.60h 25	0.34 9	1117.30	(3/2−)	177.03	(7/2)−	
x944.4 3	0.31 8					
968.4 2	0.83 17	1145.4	(5/2−)	177.03	(7/2)−	
x978.5 2	0.53 11					
989.6 2	5.4 11	1081.72	(3/2−)	92.13	(5/2)−	
x998.2 3	0.57 14					
1002.1 2	1.00 23	1094.36	1/2−,3/2−	92.13	(5/2)−	
x1013.8 2	2.5 5					
1019.9 2	1.8 4	1094.36	1/2−,3/2−	74.56	5/2−	other Eγ: 1019.92 20 (2007ChZX; Budapest data).
1029.8 2	2.3 5	1094.36	1/2−,3/2−	64.55	3/2−	other Eγ: 1030.0 5 (2007ChZX; Budapest data).
1042.5 3	0.89 19	1117.30	(3/2−)	74.56	5/2−	
x1046.6 5	0.46 11					
1052.6f 2	2.0f 4	1117.30	(3/2−)	64.55	3/2−	
1052.6f 2	2.0f 4	1145.4	(5/2−)	92.13	(5/2)−	
1069.8@h 10	0.20 11	1145.4	(5/2−)	74.56	5/2−	
x1078.5 3	0.93 21					
1094.5 3	6.9 14	1094.36	1/2−,3/2−	0.0	1/2−	
1117.8 4	0.63 13	1117.30	(3/2−)	0.0	1/2−	
x1121.9 5	0.23 6					
x1270.1 11	0.13 7					
x1275.3 7	0.42 18					
x1277.6 10	0.25 15					
x1291.9 7	0.19 6					
1295.5f 5	0.31f 8	1360.1	1/2(+)	64.55	3/2−	
1295.5f 5	0.31f 8	1386.87	1/2−,3/2−	92.13	(5/2)−	
1312.1 3	0.52 12	1386.87	1/2−,3/2−	74.56	5/2−	
x1315.4 6	0.23 7					
1322.5 3	0.45 10	1386.87	1/2−,3/2−	64.55	3/2−	
x1330.8 4	0.30 8					
x1356.0 7	0.35 8					
1359.6 5	0.47 11	1360.1	1/2(+)	0.0	1/2−	
1387.0 4	0.34 8	1386.87	1/2−,3/2−	0.0	1/2−	
x1393.3 6	0.28 8					
x1396.5 5	0.38 10					
x1407.9 4	0.42 10					
x1412.7 3	1.5 3					
x1417.8 6	0.30b 9					
x1423.2 3	0.84 18					
3765.2 8	0.36 10	(6003.17)	1/2+	2237.9	1/2,3/2	
3777.8 11	0.17 6	(6003.17)	1/2+	2225.3	1/2−,3/2−	
3783.7 7	0.55 14	(6003.17)	1/2+	2219.4	1/2,3/2	

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^{168}Er(n,γ) E=thermal 1970Mu15 (continued)

$\gamma(^{169}Er)$ (continued)

E_γ †	I_γ ‡ e	E_i(level)	J_i^π	E_f	J_f^π	Comments
3817.9 *8*	0.41 *12*	(6003.17)	$1/2^+$	2185.2	1/2,3/2	other Eγ: 3818.9 *5* (2007ChZX; Budapest data).
3822.7 *7*	1.7 *4*	(6003.17)	$1/2^+$	2180.4	$1/2^-$,$3/2^-$	
3837.6 *16*	0.05 *2*	(6003.17)	$1/2^+$	2165.5	$1/2^-$,$3/2^-$	
3861.9 *26*	0.07 *3*	(6003.17)	$1/2^+$	2141	$1/2^{(-)}$,$3/2^{(-)}$	
3877.9 *7*	1.5 *3*	(6003.17)	$1/2^+$	2125.2	$1/2^-$,$3/2^-$	
3890.6 *9*	0.18 *5*	(6003.17)	$1/2^+$	2112.5	1/2,3/2	
3940.1 *8*	0.33 *8*	(6003.17)	$1/2^+$	2063.0	1/2,3/2	
3956.0 *13*	0.10 *4*	(6003.17)	$1/2^+$	2047.1	1/2,3/2	
3973.8 *8*	0.24 *6*	(6003.17)	$1/2^+$	2029.3	$1/2^-$,$3/2^-$	other Eγ: 3972.1 *9* (2007ChZX; Budapest data).
4006.1 *7*	0.82 *17*	(6003.17)	$1/2^+$	1997.0	1/2,3/2	
4024.2 *7*	0.22 *5*	(6003.17)	$1/2^+$	1978.9	1/2,3/2	
4047.8 *23*	0.09 *5*	(6003.17)	$1/2^+$	1955.3	$1/2^-$,$3/2^-$	
4055.1 *14*	0.14 *5*	(6003.17)	$1/2^+$	1948.0	$1/2^-$,$3/2^-$	
4074.3 *7*	2.3 *5*	(6003.17)	$1/2^+$	1928.8	$1/2^-$,$3/2^-$	
4105.4 *7*	0.61 *13*	(6003.17)	$1/2^+$	1897.7	1/2,3/2	other Eγ: 4103.6 *4* (2007ChZX; Budapest data).
4135.9 *8*	0.27 *7*	(6003.17)	$1/2^+$	1867.2	$1/2^{(-)}$,$3/2^{(-)}$	
4154.7 *8*	0.31 *8*	(6003.17)	$1/2^+$	1848.4	$1/2^-$,$3/2^-$	
4163.8 *8*	0.29 *7*	(6003.17)	$1/2^+$	1839.3	$1/2^{(-)}$,$3/2^{(-)}$	
4177.1 *11*	0.19 *6*	(6003.17)	$1/2^+$	1826.0	1/2,3/2	
4183.4 *17*	0.09 *3*	(6003.17)	$1/2^+$	1819.7	$1/2^{(-)}$,$3/2^{(-)}$	
4196.8 *19*	0.05 *2*	(6003.17)	$1/2^+$	1806.3	1/2,3/2	
4207.8 *9*	0.18 *5*	(6003.17)	$1/2^+$	1795.3	1/2,3/2	
4219.5 *7*	0.39 *9*	(6003.17)	$1/2^+$	1783.6	1/2,3/2	
4293.0 *7*	0.27 *6*	(6003.17)	$1/2^+$	1710.1	1/2,3/2	other Eγ: 4292.5 *4* (2007ChZX; Budapest data).
4323.1 *9*	0.11 *3*	(6003.17)	$1/2^+$	1680.0	1/2,3/2	
4335.6 *16*	0.05 *2*	(6003.17)	$1/2^+$	1667.5	1/2,3/2	
4355.9 *6*	0.42 *9*	(6003.17)	$1/2^+$	1647.2	$(1/2^+)$	
4449.4 *7*	0.36 *13*	(6003.17)	$1/2^+$	1553.7	$1/2^-$,$3/2^-$	
4473.5 *7*	0.34 *8*	(6003.17)	$1/2^+$	1529.6	$1/2^-$,$3/2^-$	
4515.1 *11*	0.30 *10*	(6003.17)	$1/2^+$	1488.0	$1/2^-$,$3/2^-$	
4519.2 *18*	0.14 *10*	(6003.17)	$1/2^+$	1483.9	1/2,3/2	
4532.4 *7*	0.44 *10*	(6003.17)	$1/2^+$	1470.7	$1/2^{(-)}$,$3/2^{(-)}$	
4616.5 *4*	6.0 *12*	(6003.17)	$1/2^+$	1386.87	$1/2^-$,$3/2^-$	
4860.3 *5*	0.18 *4*	(6003.17)	$1/2^+$	1142.8	1/2,3/2	
4887.1 *15*	0.31 *13*	(6003.17)	$1/2^+$	1117.30	$(3/2^-)$	
4908.8 *4*	10.3 *21*	(6003.17)	$1/2^+$	1094.36	$1/2^-$,$3/2^-$	
4922.4 *15*	0.27 *11*	(6003.17)	$1/2^+$	1081.72	$(3/2^-)$	
5142.9 *7*	0.76 *16*	(6003.17)	$1/2^+$	860.10	$(3/2^+,5/2^+)$	
5289.0 *8*	0.12 *3*	(6003.17)	$1/2^+$	714.54	$(3/2)^-$	
5441.0 *4*	3.0 *6*	(6003.17)	$1/2^+$	562.04	$(1/2)^-$	
5938.2 *4*	6.6 *14*	(6003.17)	$1/2^+$	64.55	$3/2^-$	
6002.4 *7*	0.12 *3*	(6003.17)	$1/2^+$	0.0	$1/2^-$	

† From 1970Mu15, except As noted.
‡ Relative Iγ (1970Mu15); uncertainties include 20% assumed overall uncertainty. Corrected by authors for target self-absorption. See comment with normalization to obtain absolute intensities.
# From ^{167}Er(n,γ) (seen as impurity) (1966Ko03); value used by 1970Mu15 for energy calibration.
@ Assignment to ^{169}Er uncertain.
& Includes components from 99.0γ and 99.3γ in ^{168}Er.
a Reported uncertainty of 0.03 is most probably 0.30.
b Evaluator assumes that Iγ=0.3 *9*, as reported by 1970Mu15, was intended to be Iγ=0.30 *9*.
c Deduced from Iγ=0.54 *11* (total for both placements of 760.7γ) and adopted relative branching from 853.0 level.

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^{168}Er(n,γ) E=thermal 1970Mu15 (continued)

$\gamma(^{169}Er)$ (continued)

[d] Deduced from Iγ=1.6 *4* (total for both placements of 787.9γ) and adopted relative branching from 853.0 level.
[e] For intensity per 100 neutron captures, multiply by 0.74.
[f] Multiply placed with undivided intensity.
[g] Multiply placed with intensity suitably divided.
[h] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

^{168}Er(n,γ) E=thermal 1970Mu15

Level Scheme

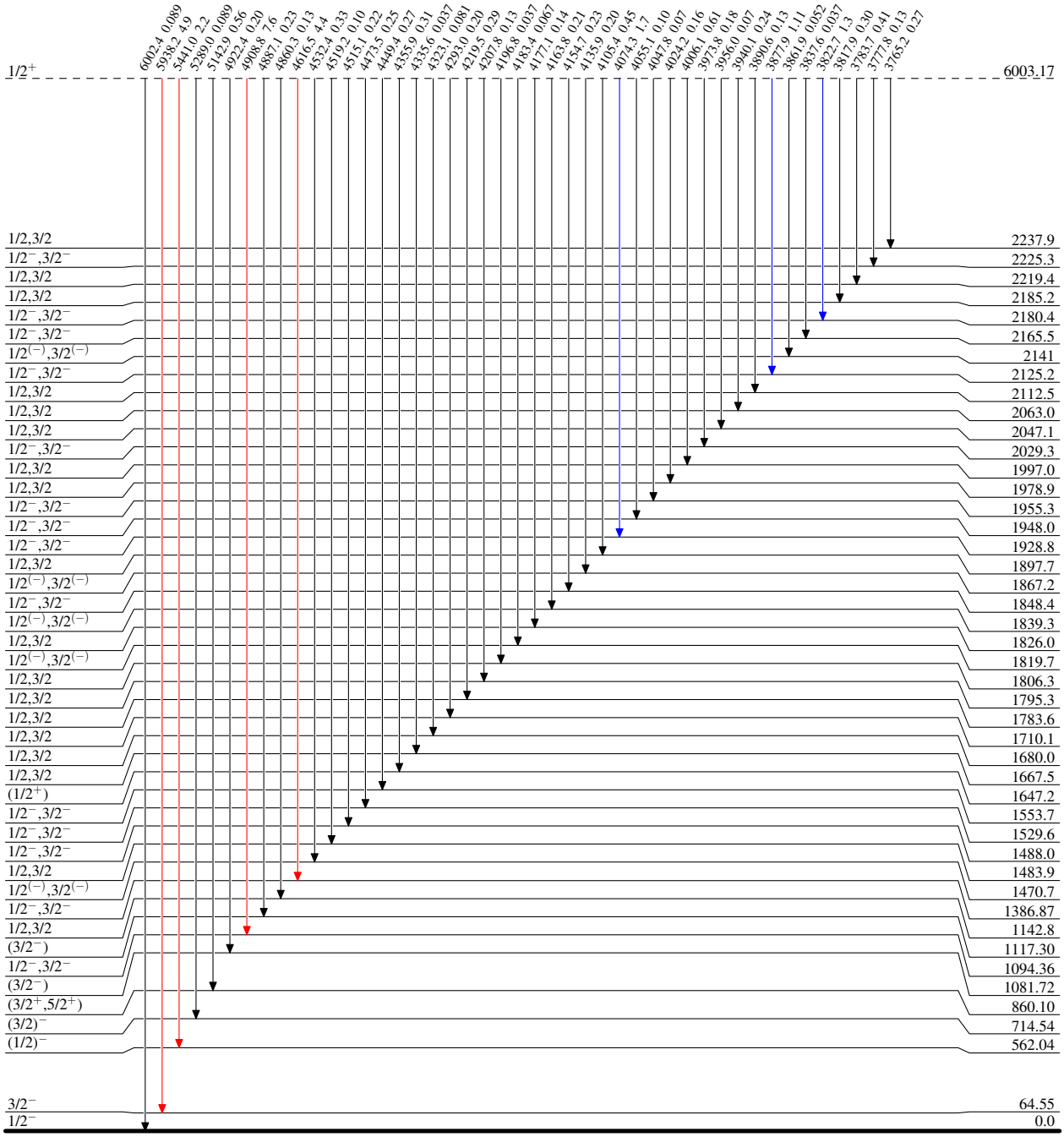
Intensities: Iγ per 100 neutron captures

Legend

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

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

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



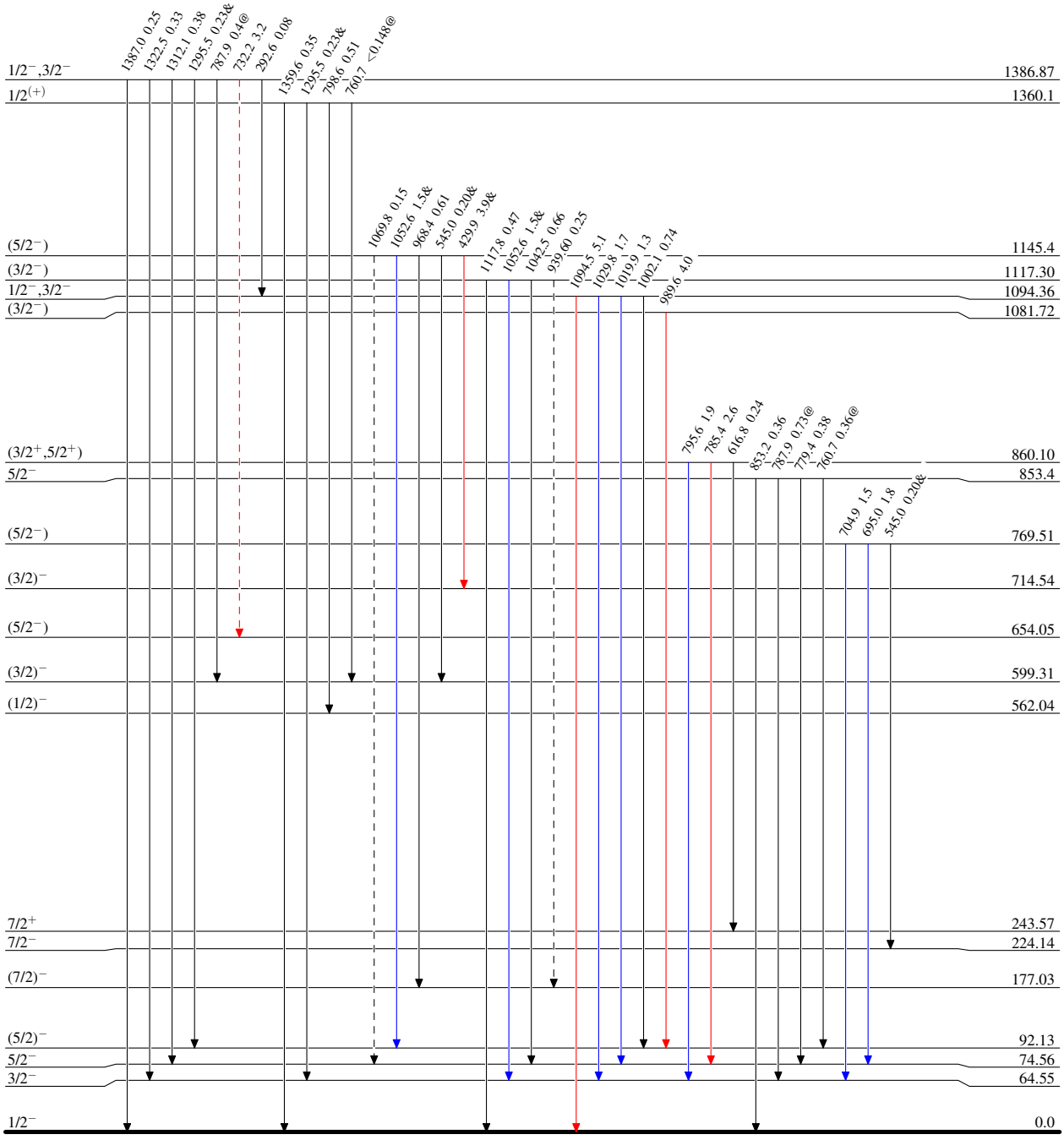
$^{169}_{68}Er_{101}$

^{168}Er(n,γ) E=thermal 1970Mu15

Level Scheme (continued)

Intensities: Iγ per 100 neutron captures
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

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)



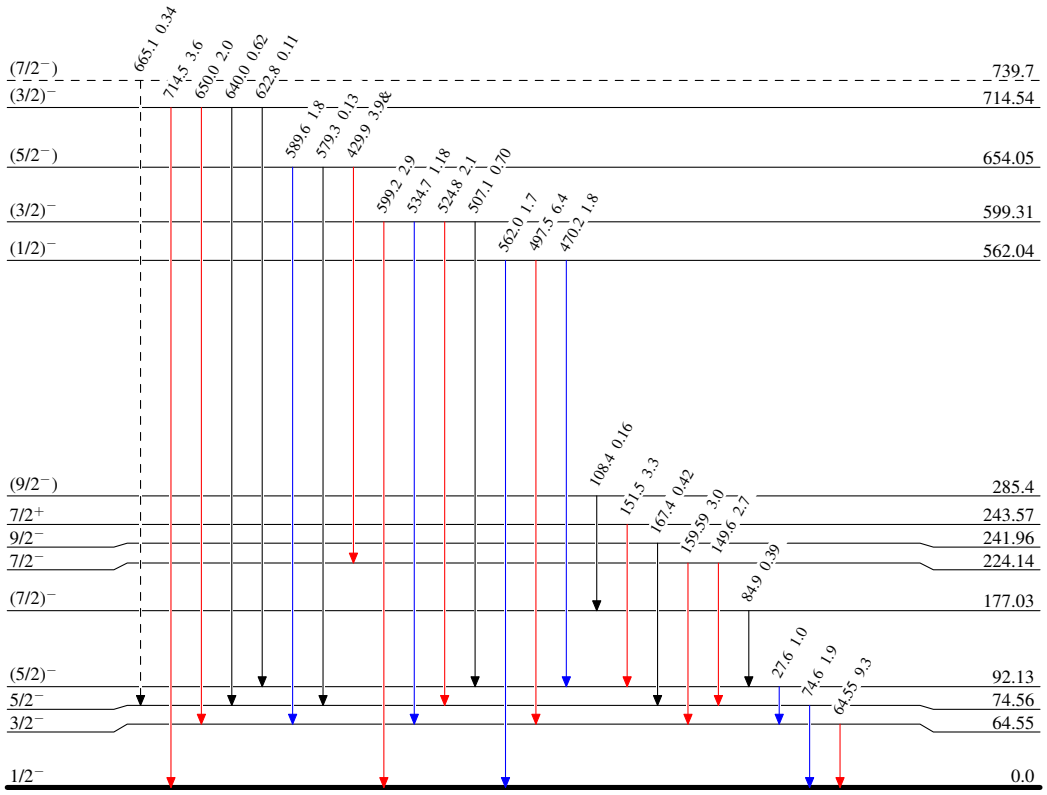
$^{169}_{68}Er_{101}$

^{168}Er(n,γ) E=thermal 1970Mu15

Level Scheme (continued)

Intensities: Iγ per 100 neutron captures
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

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)



$^{169}_{68}Er_{101}$