^{92}Zr(n,γ) E=thermal 2007ChZX,1977Ba33

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Coral M. Baglin	NDS 112, 1163 (2011)	15-Dec-2010

σ_n=0.26 *8* (2006MuZX). abundance(^{92}Zr)=17.15% 8.
Other: 1972Gr23.
2007ChZX: includes measurements of Eγ and absolute elemental Iγ (designated As 'Budapest data' here) for 6 secondary and 2 primary transitions; natural Zr target.
1977Ba33: 88.69% ^{92}Zr target, Ge(Li); measured Eγ, Iγ.
1972Gr23: 88.6% ^{92}Zr isotopically-enriched target; measured Eγ (Eγ=50-1500 and 1400-8000), Iγ per 100 N captures.
The level scheme proposed in 1977Ba33 poses several problems. Of the proposed levels, three have no observed deexcitation γ (947, 1422, 2456 levels), five have no primary γ feeding (1650, 1827, 1907, 2182, 2374 levels); Eγ for 3274 keV and 3458 keV cascade γ rays are 2σ from least-squares adjusted value; several Eγ values (1427γ, 1650γ, 1827γ) are close to those for γ rays known from β^- decay to deexcite different levels known in both β^- decay and (n,γ) E=res. Consequently, the evaluator proposes that the 1427γ, 1650γ, 1827γ deexcite levels seen in (n,γ) E=res at 1425, 1918, 2097, respectively; this eliminates the 947, 1650, 1827, 2374 levels and introduces 1917 and 2094 levels (which, unfortunately, also have no known primary feeding), resulting in better consistency with β^- decay and (n,γ) E=res data.

^{93}Zr Levels

E(level)[†]	J$^\pi$[‡]	$T_{1/2}$	Comments
0.0	5/2$^+$	1.61×10^6 y *5*	$T_{1/2}$: from Adopted Levels.
266.79 *7*	3/2$^+$		
946.63 *20*	1/2$^+$		
1424.92 *17*	3/2$^+$,5/2$^+$		
1908.3[@] *8*	1/2$^+$		
1916.89[#@] *22*	(1/2,3/2,5/2$^+$)		
2093.5[#@] *7*	1/2$^+$		
2184.2[@] *4*	(1/2$^+$,3/2)		
2457.02[&] *21*	(1/2$^+$,3/2)		
2473.6 *7*			
2531.0 *4*	3/2$^+$,5/2$^+$		
3276.1 *4*	3/2$^+$,5/2$^+$		
(6734.64 *24*)	1/2$^+$		J$^\pi$: s-wave neutron capture by 0$^+$ target. E(level): cf. S(n)=6734.5 *4* (2003Au03), 6735.9 *23* (1977Ba33), 6733.0 *11* (1972Gr23).

[†] From least-squares fit to Eγ.
[‡] From Adopted Levels.
[#] Proposed by evaluator to improve consistency with β^- decay and (n,γ) E=res data. Level fed by primary γ in (n,γ) E=res.
[@] No primary γ feeding of this level is reported.
[&] Level known from β^- decay, but not reported in (n,γ) E=res.

γ(^{93}Zr)

E$_\gamma$[†]	I$_\gamma$[†&]	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Comments
266.78 *7*	20.4 *11*	266.79	3/2$^+$	0.0	5/2$^+$	other Eγ (Iγ): 267.1 *5* (0.81) (1972Gr23).
[x]335.8[#@] *5*	0.23[#@]					
[x]433.6[#@] *5*	0.23[#@]					
946.62 *20*	4.5 *11*	946.63	1/2$^+$	0.0	5/2$^+$	

Continued on next page (footnotes at end of table)

^{92}Zr(n,γ) E=thermal 2007ChZX,1977Ba33 (continued)

$\gamma(^{93}Zr)$ (continued)

E_γ [†]	I_γ [†&]	E_i(level)	J_i^π	E_f	J_f^π	Comments
1425.02 *18*	6.5 *11*	1424.92	3/2$^+$,5/2$^+$	0.0	5/2$^+$	other Eγ (Iγ): 1426.8 *4* (10.3 *5*) (1977Ba33). Eγ: placed by evaluator; γ placed by 1977Ba33 from a 2372 level.
1641.5[‡] *8*	2.65[‡] *22*	1908.3	1/2$^+$	266.79	3/2$^+$	Placement consistent with β^- decay data.
1650.09 *20*	6.5 *16*	1916.89	(1/2,3/2,5/2$^+$)	266.79	3/2$^+$	other Eγ (Iγ): 1650 *1* (2.7 *5*) (1977Ba33). Eγ: placed by evaluator; 1977Ba33 placed γ from an otherwise unknown 1650 level.
1826.7[‡] *7*	2.4[‡] *5*	2093.5	1/2$^+$	266.79	3/2$^+$	Eγ: placed by evaluator; placed by 1977Ba33 from a 1827 level.
1917.4 *4*	3.8 *11*	2184.2	(1/2$^+$,3/2)	266.79	3/2$^+$	other Eγ (Iγ): 1916.2 *6* (1.9 *3*) (1977Ba33). Eγ misprinted as 1616.2 in table 2 of 1977Ba33. Placement consistent with β^- decay data.
2190.15 *22*	9.9 *11*	2457.02	(1/2$^+$,3/2)	266.79	3/2$^+$	Eγ: reported only In 2007ChZX; γ must be present if 4278γ is indeed a primary G.
2474.4[‡] *9*	3.2[‡] *5*	2473.6		0.0	5/2$^+$	
2531.4[‡] *5*	3.1[‡] *4*	2531.0	3/2$^+$,5/2$^+$	0.0	5/2$^+$	
3274.4[‡] *6*	1.9[‡] *3*	3276.1	3/2$^+$,5/2$^+$	0.0	5/2$^+$	
3457.7 *4*	4.9 *5*	(6734.64)	1/2$^+$	3276.1	3/2$^+$,5/2$^+$	Eγ: weighted average of 3458.1 *6* (1977Ba33) and 3457.4 *5* (1972Gr23). Iγ: from 1977Ba33. Other Iγ: 2.5 (1972Gr23).
[x]3551.6[#@] *11*	1.17[#@]					
[x]3639.5[#@] *11*	2.25[#@]					
4204.0 *5*	1.67 *22*	(6734.64)	1/2$^+$	2531.0	3/2$^+$,5/2$^+$	Eγ: weighted average of 4204.2 *6* (1977Ba33) and 4203.5 *11* (1972Gr23). Iγ: from 1977Ba33. Other Iγ: 1.13 (1972Gr23).
4261.9 *10*	1.13 *16*	(6734.64)	1/2$^+$	2473.6		Eγ: weighted average of 4262.6 *8* (1977Ba33) and 4260.5 *11* (1972Gr23). Iγ: from 1977Ba33. Other Iγ: 1.6 (1972Gr23).
4277.4 *3*	3.8 *16*	(6734.64)	1/2$^+$	2457.02	(1/2$^+$,3/2)	other Eγ (Iγ): 4278.3 *3* (5.2 *3*) (1977Ba33); 4276.8 *11* (3.9) (1972Gr23).
5310.1 *4*	5.4 *9*	(6734.64)	1/2$^+$	1424.92	3/2$^+$,5/2$^+$	other Eγ: 5312.2 *5* (1977Ba33), 5309.8 *11* (1972Gr23).
6467.8 *23*	3.2 *5*	(6734.64)	1/2$^+$	266.79	3/2$^+$	Eγ: unweighted average of 6470.0 *8* (1977Ba33) and 6465.5 *11* (1972Gr23). Iγ: from 1977Ba33. Other Iγ: 2.1 (1972Gr23).
6733.9 *12*	3.2 *5*	(6734.64)	1/2$^+$	0.0	5/2$^+$	Eγ: unweighted average of 6735.0 *7* (1977Ba33) and 6732.7 *11* (1972Gr23). Iγ: from 1977Ba33. Other Iγ: 2.1 (1972Gr23).

[†] From 'Budapest data' In 2007ChZX, except As noted. Iγ is photon intensity per 100 neutron captures calculated by the evaluator from absolute elemental cross sections In 2007ChZX assuming σ_n=0.26 *8* (2006MuZX) and abundance(^{92}Zr)=17.15% 8; the uncertainty shown here does not include the 31% uncertainty In σ_n. Iγ data from 1972Gr23 and 1977Ba33, renormalized so I(5310γ)=5.4 are given for comparison; their uncertainties do not include the 16% uncertainty In the 5310γ elemental cross section datum from 2007ChZX.

[‡] From 1977Ba33. relative Iγ renormalized so I(5310γ)=5.4 as determined In 'Budapest data' from 2007ChZX.

[#] Reported by 1972Gr23 only. Iγ from 1972Gr23 renormalized so I(5310γ)=5.4.

[@] Evaluator questions whether this is a ^{93}Zr G.

[&] Intensity per 100 neutron captures.

[x] γ ray not placed in level scheme.

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Level Scheme

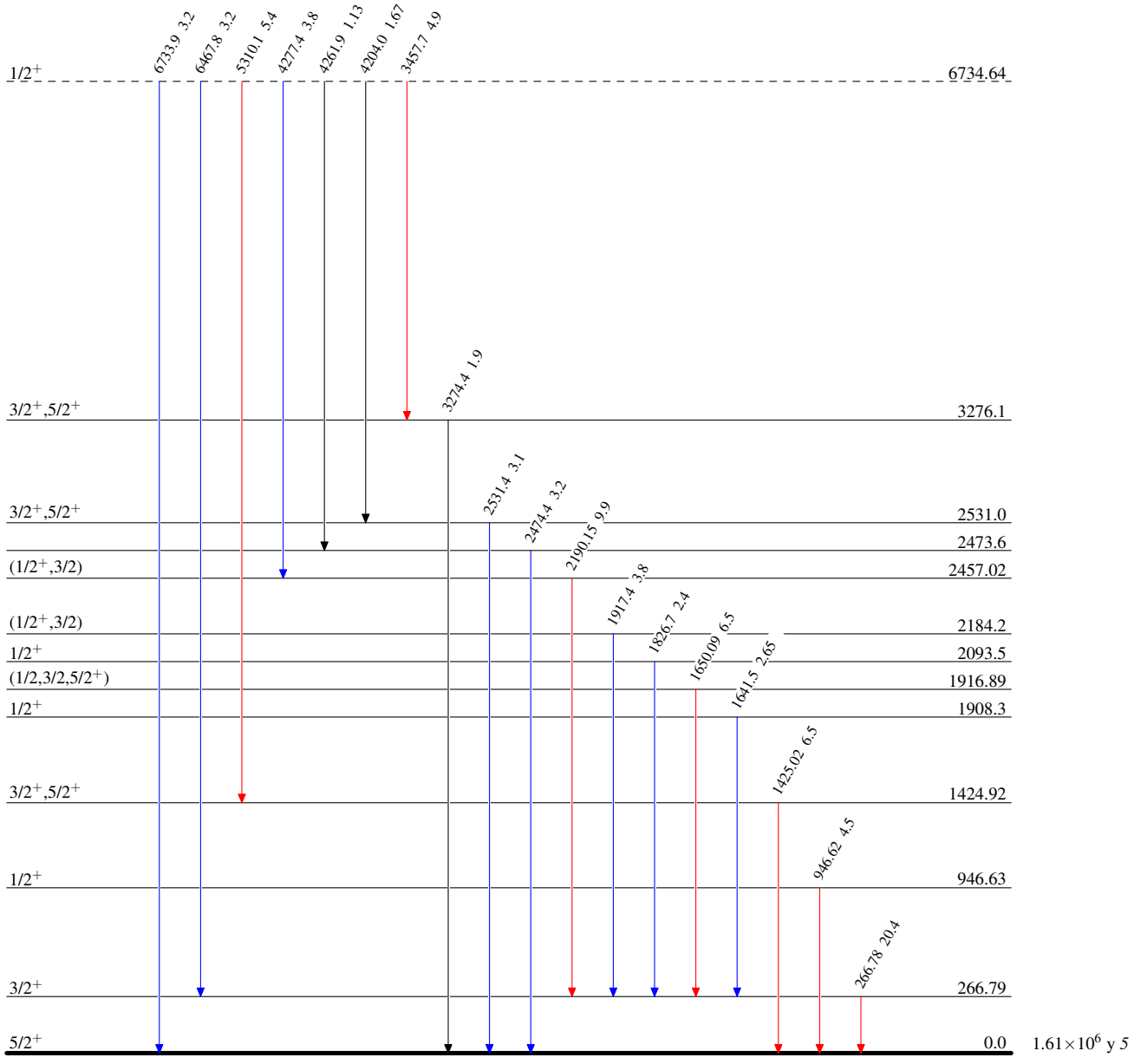
Intensities: Iγ per 100 neutron captures In ^{92}Zr

Legend

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

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

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



$^{93}_{40}Zr_{53}$