^{90}Zr(α,2nγ) 1978Nu01,1978Ba62,1971Le19

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Coral M. Baglin	NDS 113, 2187 (2012)	15-Sep-2012

Others: 1971Co08, 1971Na16, 1974Ba11, 1977Ha49, 1978Ha52.
1978Ba62: E(α)=26 MeV. Eγ, $\gamma\gamma$ coin (prompt and delayed).
1978Nu01: E(α)=28 MeV. Eγ, Iγ, $\gamma(\theta)$, $\gamma\gamma$ coin (prompt and delayed).
1977Ha49: E(α)=24 MeV. Eγ, $\gamma(\theta)$, γ(t), $\gamma(\theta$,H,t).
1974Ba11: E(α)=24 MeV. Measured Q(^{94}Mo)/Q(^{92}Mo) by TDPAD.
1971Co08: E(α)=20-24 MeV. Eγ, $\gamma(\theta$,H,t).
1971Le19, 1969Ja03: E(α)=30 MeV. Eγ, Iγ, $\gamma(\theta)$, beam-γ(t).
1971Na16: E(α)=25 MeV. $\gamma(\theta$,H,t).

^{92}Mo Levels

The level scheme is a combination of schemes from 1978Nu01 and 1978Ba62, based on extensive prompt and delayed $\gamma\gamma$ coin data and intensity balance. Except for a reassignment by 1978Nu01 for the 111γ, both 1978Nu01 and 1978Ba62 confirm the levels proposed in 1971Le19, and each proposes a number of additional levels none of which is confirmed by the other. 1977Ha49 conclude that the yrast cascade passes via the 11^- state, largely avoiding population of the 8^+ state.

E(level)[†]	J$^\pi$[‡]	T$_{1/2}$	Comments
0.0	0^+		
1509.59 *13*	2^+		
2282.65 *18*	4^+		
2527.05 *24*	5^-		
2612.44 *21*	6^+		
2760.4 *3*	8^+	207[#] ns *8*	μ=+11.30 *5* (1977Ha49) μ: g-factor=1.413 *6* (1977Ha49,1978Ha52) from TDPAD. others: +1.419 *10* (1977Ku22, TDPAD), 1.409 *16* (1971Na16), 1.40 *7* (1971Co08). Q: Q(^{94}Mo, 8^+)/Q(^{92}Mo, 8^+)=1.48 *12* (1974Ba11, TDPAD).
3007.0 *3*			
3063.6 *11*			
3367.6 *14*			
3624.8 *3*	7^-		
3752.7 *14*			
3758.1 *11*			
3871.6 *10*			
4251.6 *4*	9^-		
4328.5? *11*			
4486.5 *5*	11^-	8.7[@] ns *2*	
5122.4 *10*	10^+		
5151.8 *5*	$(10,11,12)^-$		
5312.5 *21*			J$^\pi$: J=(10) proposed by 1978Ba62; no justification given.
5862.7 *11*	12^+		
6571.9[&] *21*			
6683.1[&] *2*			
7334.0?[&] *21*			

[†] From least-squares fit to Eγ.
[‡] Proposed by 1978Nu01 on basis of $\gamma(\theta)$ and Iγ balance.
[#] Weighted average of 191 ns *7* (1971Co08, (n(0.5-3.5 MeV)−148γ(t))), 214 ns *5* (1977Ha49), 219 ns *22* (1971Le19). Other: 240 ns *50* (1971Le19).

Continued on next page (footnotes at end of table)

^{90}Zr(α,2nγ) 1978Nu01,1978Ba62,1971Le19 (continued)

^{92}Mo Levels (continued)

[@] From 235γ(t). Other γ(t) data give 8.4 ns *4*, 9.5 ns *5*, 8.0 ns *7*, 10.0 ns *9*, 9.0 ns *9* (1971Le19). The weighted average of all data is 8.75 ns *18*.
[&] Possibly≈20 keV high; see comment on 2085γ.

γ(^{92}Mo)

E_γ [†]	I_γ [‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	α[e]	Comments
85.5 *2*	4.5 *1*	2612.44	6^+	2527.05	5^-			
111.2[&] *2*	2.5 *1*	6683.1		6571.9		D		A_2=−0.10 *4*, A_4=+0.13 *9* (1971Le19).
148.0 *2*	27.1 *1*	2760.4	8^+	2612.44	6^+	E2[c]	0.292	A_2=−0.05 *3*, A_4=+0.08 *4* (1971Le19); A_2=+0.05 *2* (1971Na16), +0.099 *10* (1971Co08), +0.082 *15* (1974Ba11).
234.9 *2*	21.4 *1*	4486.5	11^-	4251.6	9^-	Q		A_2=+0.13 *4*, A_4=−0.01 *7* (1971Le19).
244.5 *2*	50.9 *2*	2527.05	5^-	2282.65	4^+	D		A_2=−0.15 *4*, A_4=0.00 *6* (1971Le19).
304[a] *1*		3367.6		3063.6				
329.76[b] *12*	37.7 *2*	2612.44	6^+	2282.65	4^+	(E2)	0.01762	A_2=+0.28 *4* (1977Ha49); A_2=+0.14 *3*, A_4=0.05 *5* (1971Le19).
385[a] *1*		3752.7		3367.6				
480.0 *2*	2.5 *1*	3007.0		2527.05	5^-			
536.6[a] *10*		3063.6		2527.05	5^-			
[x]596[a] *1*								
626.8 *2*	28.2 *2*	4251.6	9^-	3624.8	7^-	Q		A_2=+0.17 *3*, A_4=0.00 *5* (1971Le19).
650.9[@f] *2*	1.5 *3*	7334.0?		6683.1				
665.3 *2*	2.6 *2*	5151.8	$(10,11,12)^-$	4486.5	11^-	(M1)		A_2=+0.03 *12*; M1 (1978Nu01).
689[a] *1*		3752.7		3063.6				
740.3 *2*	3.3 *2*	5862.7	12^+	5122.4	10^+	(E2)		A_2=+0.32 *9*; stretched E2 (1978Nu01).
773.05[b] *12*	96.1 *4*	2282.65	4^+	1509.59	2^+	(E2)		A_2=+0.365 *10* (1978Nu01), +0.29 *3* (1977Ha49), +0.15 *3* (1971Le19).
1097.7 *2*	29.7 *3*	3624.8	7^-	2527.05	5^-	(E2)		A_2=+0.369 *15* (1978Nu01); A_2=+0.19 *9*, A_4=−0.01 *9* (1971Le19).
1231[a] *1*		3758.1		2527.05	5^-			
1509.58[b] *13*	100.0 *6*	1509.59	2^+	0.0	0^+	(E2)		A_2=+0.252 *7* (1978Nu01), +0.31 *3* (1977Ha49), +0.15 *4* (1971Le19).
1568[af] *1*		4328.5?		2760.4	8^+			
[x]1680[a] *1*								
[x]1735[a] *1*								
[x]1754[a] *1*								
[x]2062[a] *1*								
2085.4[@d] *20*	3.4 *2*	6571.9		4486.5	11^-			A_2=+0.02 *12*.
2362[a] *1*		3871.6		1509.59	2^+			
2362[a] *1*	7.0 *4*	5122.4	10^+	2760.4	8^+	(E2)		E_γ: 2357.2 *20* in 1978Nu01; placed by 1978Nu01 only. A_2=+0.33 *6*; stretched E2 (1978Nu01).
2552[a] *1*		5312.5		2760.4	8^+			

[†] From 1978Nu01, unless noted otherwise.
[‡] From 1978Nu01 for Eα=28 MeV, θ=55°. Uncertainties include only statistical deviations.
[#] From $\gamma(\theta)$. 1978Nu01 assume their mult=Q transitions are E2. Note: A_2, A_4 from 1971Le19 are significantly attenuated but can, nevertheless, differentiate between Q and D transitions.
[@] Reported by 1978Nu01 only.
[&] The 111γ was suggested by 1971Le19 to deexcite a level at 4597 keV. However, evaluator adopts placement and Iγ of

Continued on next page (footnotes at end of table)

^{90}Zr(α,2nγ) 1978Nu01,1978Ba62,1971Le19 (continued)

γ(^{92}Mo) (continued)

1978Nu01, who suggest that discrepant Iγ=6.7 *20* of 1971Le19 includes a contribution from (α,pγ) reaction on ^{16}O in oxide target.

[a] From 1978Ba62. ΔE not given by authors; however, Eγ values from 1978Ba62 differ from adopted Eγ by ≤1.2 keV (typically 0.4 keV higher than adopted), so evaluator has assigned ΔE=1 keV to this datum.

[b] Weighted average of data from 1978Nu01 and 1977Ha49.

[c] α(exp)=0.24 *10*, based on relative cascade intensities in delayed spectrum (1971Le19). α(theory)=0.041(E1), 0.086(M1), 0.294(E2), 0.645(M2), so α(exp) consistent with E1+M2 (δ=0.44 to 1.0) or E2(+?); the former is ruled out on the basis of RUL which requires δ(E1,M2)<0.11.

[d] Eγ=2085.4 is quoted consistently throughout 1978Nu01; however, two Eγ values from independent (^{16}O,4nγ) and (^{37}Cl,2p2nγ) studies are each 20 keV lower; evaluator suspects that Eγ from 1978Nu01 is incorrect or γ is misplaced, and does not adopt it.

[e] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

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

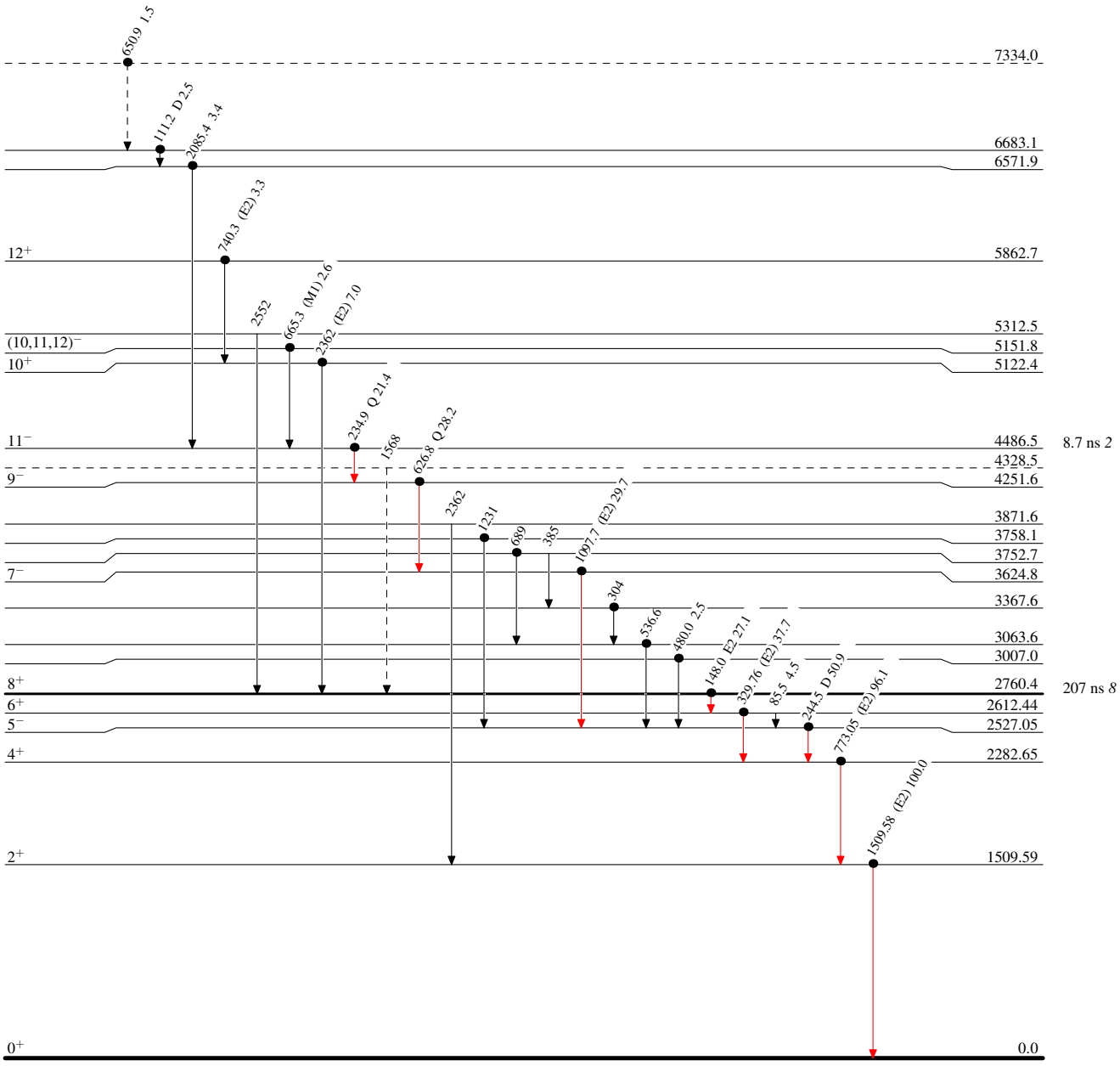
[x] γ ray not placed in level scheme.

^{90}Zr(α,2nγ) 1978Nu01,1978Ba62,1971Le19

Level Scheme

Intensities: Relative Iγ for Eα=28 MeV, θ=55°

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)
- Coincidence



$^{92}_{42}Mo_{50}$