^{64}Zn(p,p′γ) 1975An20,1985Pa07

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 178, 41 (2021).	12-Nov-2021

1975An20: E=6.02 MeV. Measured γ, pγ coin.

1985Pa07: E=5.9-6.9 MeV. Measured γ, ce, pγ coin, pγ(t), pce(t), internal pair conversion. Data for 0^+ states. See also 1986Pa23, 1986Pa19, 1983Pa09 and 1983Pa05 from the same group.

Others:

1979VaZZ, 1966Va19, 1964Se02, 1963Se02, 1961Va25: E≤5.2 MeV (1966Va19,1979VaZZ), measured γ, pγ coin. E=4.4-5.0 MeV (1964Se02,1963Se02), measured γ, γ(θ). E=5.0 MeV (1961Va25), measured γ.

Cross section data: 1978KoZY, 1977KoYK (E=7-26 MeV); E<3 MeV (1976Kr16); E<4 MeV (1971Ne05); E=5.8 MeV (1964Sz02).

^{64}Zn Levels

E(level)†	Jπ‡	$T_{1/2}$	Comments
0.0	0^+		
991.9 *4*	2^+		
1799.8 *4*	2^+		
1910.8 *5*	0^+	0.95 ns *5*	$T_{1/2}$: γ(t) (1985Pa07).
2304.8 *5*	4^+		
2609.4 *5*	0^+		
2737.1 *5*	4^+		
2793.7 *9*	2^+		
2982.9 *6*	3^+		
2997.9 *11*	3^-		
3005.3 *7*	2^+		
3071.5 *8*	$(1,2^+)$		
3093.4 *8*	$(3)^+$		
3186.9 *6*	1^+		
3198.4 *14*	(2,3)		
3262.2 *7*	1		
3366.0 *7*	1^+		
3425.8 *11*	1^+		
3452.8 *11*	$(1,2^+)$		
3536.9 *12*			
3546.1 *11*			
3588.4 *25*			
3598.0 *11*			Level proposed by 1985Pa07.
3700.4 *15*			
3709.7 *8*	(2^+)		
3720.0 *16*			
3800# *3*	1^+		
4140# *3*	$(2,1)^+$		

† From a least-squares fit to Eγ data, omitting 1390γ from 3198 level, as it fits poorly.

‡ From the Adopted Levels for selected levels for which the the J^π assignments are limited to at the most two choices.

Level reported by 1966Va19 with pronounced g.s. decay.

^{64}Zn(p,p′γ) 1975An20,1985Pa07 (continued)

γ(^{64}Zn)

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	$I_{(\gamma+ce)}$	Comments
111.0	0.22	1910.8	0^+	1799.8	2^+			E_γ: from pγ coin (1985Pa07). I_γ: from Iγ(111)/Iγ(919)=0.027 *3* (1985Pa07).
284 *1*	0.13	3546.1		3262.2	1			
359 *2*	0.25	3546.1		3186.9	1^+			
390 *2*	0.10	3588.4		3198.4	(2,3)			
432.0 *5*	0.13	2737.1	4^+	2304.8	4^+			
502.0 *5*	0.14	3700.4		3198.4	(2,3)			
808.0 *5*	49	1799.8	2^+	991.9	2^+	D+Q		A_2=−0.20 *2*; A_4=−0.02 *3* (1964Se02) δ: −3.0 to −6.0 from γ(θ) (1963Se02,1964Se02).
809[c]	<0.06	2609.4	0^+	1799.8	2^+			
918.5 *5*	7.8	1910.8	0^+	991.9	2^+	E2		A_2=−0.01 *7*; A_4=+0.02 *10* (1964Se02) B(E2)(W.u.)=0.058 *3* Mult.: from ce data.
937.5 *5*	1.02	2737.1	4^+	1799.8	2^+			
991.5 *5*	100	991.9	2^+	0.0	0^+	Q		A_2=+0.257 *12*; A_4=−0.134 *18* (1964Se02)
[x]1084[@]	0.21							
1092 *1*	0.07	3005.3	2^+	1910.8	0^+			
1099 *1*	0.09	3709.7	(2^+)	2609.4	0^+			
[x]1164[@]	0.09							
1183.0 *5*	1.65	2982.9	3^+	1799.8	2^+			
[x]1201 *1*	0.12							Suggested placement with 3005 level not correct.
[x]1204[@]	0.23							
1208[b@c]	0.60	3005.3	2^+	1799.8	2^+			
1232 *1*	0.08	3536.9		2304.8	4^+			
[x]1245[@]	0.17							
1272 *1*	0.23	3071.5	$(1,2^+)$	1799.8	2^+			
1276 *1*	0.48	3186.9	1^+	1910.8	0^+			
1293[b@c]	0.37	3093.4	$(3)^+$	1799.8	2^+			
[x]1306[@]	0.06							
1313.0 *5*	3.7	2304.8	4^+	991.9	2^+	Q		A_2=+0.33 *4*; A_4=−0.14 *6* (1964Se02)
1352 *1*	0.16	3262.2	1	1910.8	0^+			
1387.0 *5*	0.82	3186.9	1^+	1799.8	2^+			E_γ: incorrectly listed as 1887.0 in 1975An20.
1390.0[c] *5*	0.34	3198.4	(2,3)	1799.8	2^+			E_γ: too low by about 7 keV (see the Adopted Gammas).
1406 *1*	1.24	3709.7	(2^+)	2304.8	4^+			
[x]1434[@]	0.12							
1455 *1*	0.15	3366.0	1^+	1910.8	0^+			
1462 *1*	0.29	3262.2	1	1799.8	2^+			
1515 *1*	0.18	3425.8	1^+	1910.8	0^+			
1542 *1*	0.19	3452.8	$(1,2^+)$	1910.8	0^+			
1566 *1*	0.23	3366.0	1^+	1799.8	2^+			
1617.0 *5*	3.08	2609.4	0^+	991.9	2^+	E2		A_2=−0.03 *5*; A_4=+0.01 *9* (1964Se02) Mult.: from the Adopted Gammas.
1745 *1*	0.34	2737.1	4^+	991.9	2^+			I_γ: from the Adopted Gammas, expected Iγ≈0.05.
1800.5[&] *5*	9.2	1799.8	2^+	0.0	0^+	Q		A_2=+0.31 *3*; A_4=−0.13 *4* (1964Se02)
1802[&]		2793.7	2^+	991.9	2^+			E_γ: from 1966Va19. Not reported by 1975An20. 1800.5 and 1802γ probably form a doublet. I_γ: comparison of branching ratio from 1800 level does not leave any intensity which could be assigned to 2793 level.
[x]1820[@]	0.09							
1910		1910.8	0^+	0.0	0^+	E0	0.050 *10*	E_γ,Mult.: from ce data (1985Pa07). $I_{(\gamma+ce)}$: from Ice(K)(1910)/Ice(K)(918)=6.0 *5*

Continued on next page (footnotes at end of table)

^{64}Zn(p,p′γ) 1975An20,1985Pa07 (continued)

γ(^{64}Zn) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	$I_{(\gamma+ce)}$	Comments
								(1985Pa07) and Ice(K)(1910)/I(pair)=0.46 *7* (1985Pa07,1986Pa19). X(E0/E2)=2.30 *25*, ρ^2=0.0039 *4* (1985Pa07).
2006[b@c]	2.0	2997.9	3^-	991.9	2^+			
2014[b@c]	0.93	3005.3	2^+	991.9	2^+			
2102[b@c]	1.57	3093.4	$(3)^+$	991.9	2^+			
[x]2142[@]	0.06							
2195.0 *15*	0.51	3186.9	1^+	991.9	2^+			
2206.0 *15*	0.51	3198.4	(2,3)	991.9	2^+			
2270 *1*	1.2	3262.2	1	991.9	2^+			
[x]2306.0 *15*	1.4							Suggested placement with 2305 level not correct. It may possibly be from a 3297 level.
2375.0 *15*	0.29	3366.0	1^+	991.9	2^+			
[x]2466[a]								
[x]2560[a]								
2606[a]		3598.0		991.9	2^+			
2610		2609.4	0^+	0.0	0^+	E0	9.2×10^{-5} *20*	E_γ,Mult.: from ce data (1985Pa07). $I_{(\gamma+ce)}$: from I(pair)(2610)/Iγ(1617γ)=0.000027 *6* (1985Pa07) and Ice/I(pair)(theory)≈0.10. ρ^2=0.008 *3* (1985Pa07). X(E0/E2)=0.03 *1* (1985Pa07,1986Pa23).
[x]2637[a]								
2728.0 *15*	0.25	3720.0		991.9	2^+			
[x]2737 *2*	0.09							Suggested placement with 2737 level not correct.
2793.0 *15*	0.10	2793.7	2^+	0.0	0^+			
[x]2851[@]	0.01							
[x]2923[@]	0.11							
3002[&] *2*	0.56	3005.3	2^+	0.0	0^+			
3071 *1*	0.09	3071.5	$(1,2^+)$	0.0	0^+			
3188 *3*	0.15	3186.9	1^+	0.0	0^+			I_γ: from the Adopted Gammas, expected Iγ≈0.01.
3200 *3*	0.09	3198.4	(2,3)	0.0	0^+			
3366[&] *2*	0.53	3366.0	1^+	0.0	0^+			
3425[&] *4*	3.3	3425.8	1^+	0.0	0^+			
≈3710[&]		3709.7	(2^+)	0.0	0^+			
≈3800[&]		3800	1^+	0.0	0^+			
≈4140[&]		4140	$(2,1)^+$	0.0	0^+			

[†] From 1975An20, unless otherwise noted.
[‡] From 1975An20 (θ=90°), unless otherwise stated.
[#] From γ(θ) (1964Se02), unless otherwise stated. From the Adopted Gammas, mult=Q corresponds to E2.
[@] γ ray from a level above 3720 (1975An20).
[&] γ from 1966Va19.
[a] Reported in the pair conversion spectrum only (1985Pa07).
[b] Placement based on the Adopted Gammas (evaluators). It should be noted, however, that 1975An20 propose that this γ is from a level above 3720.
[c] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

^{64}Zn(p,p′γ) 1975An20,1985Pa07

Level Scheme

Intensities: Relative I_γ

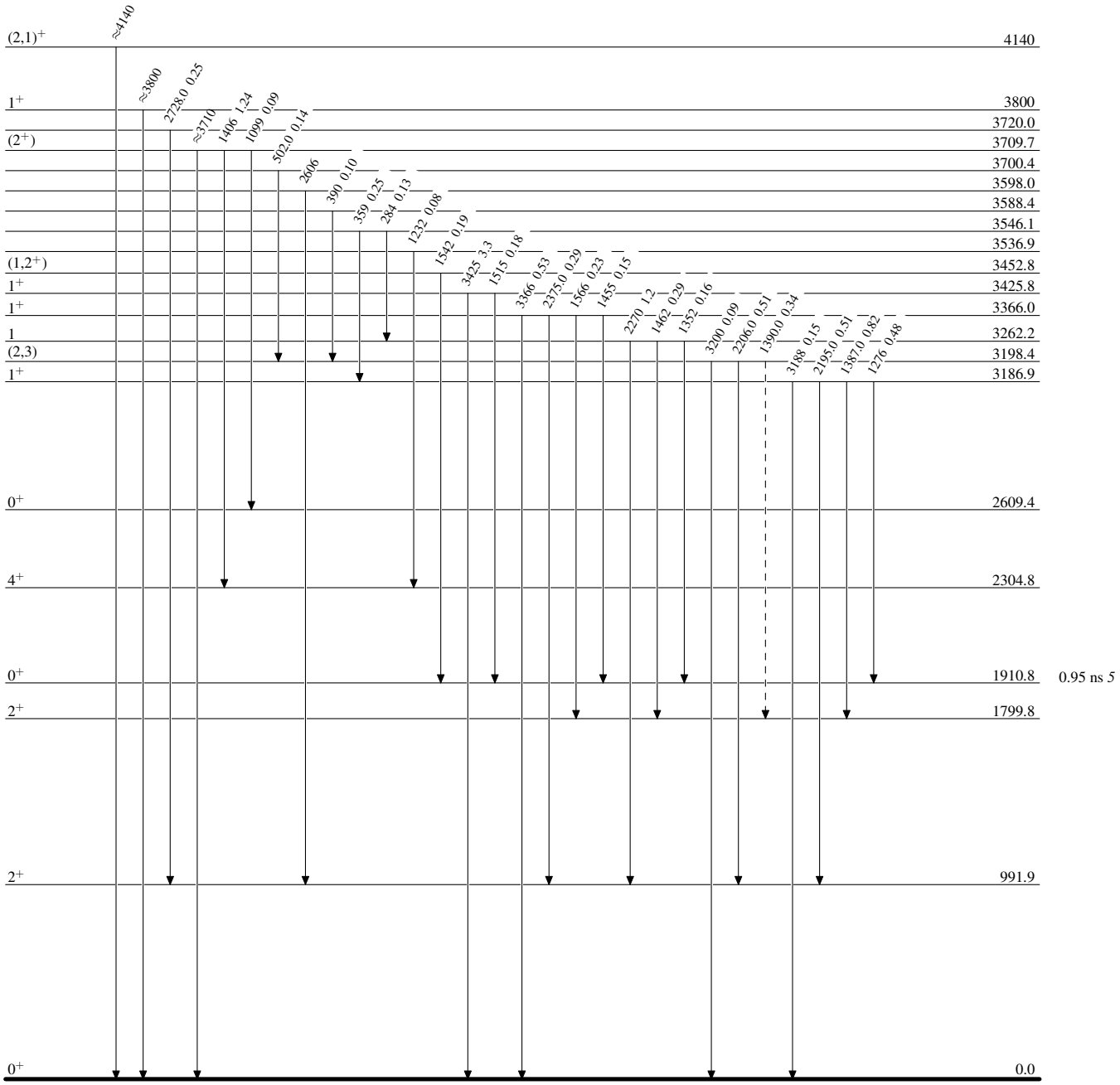
Legend

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

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

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

γ Decay (Uncertain)

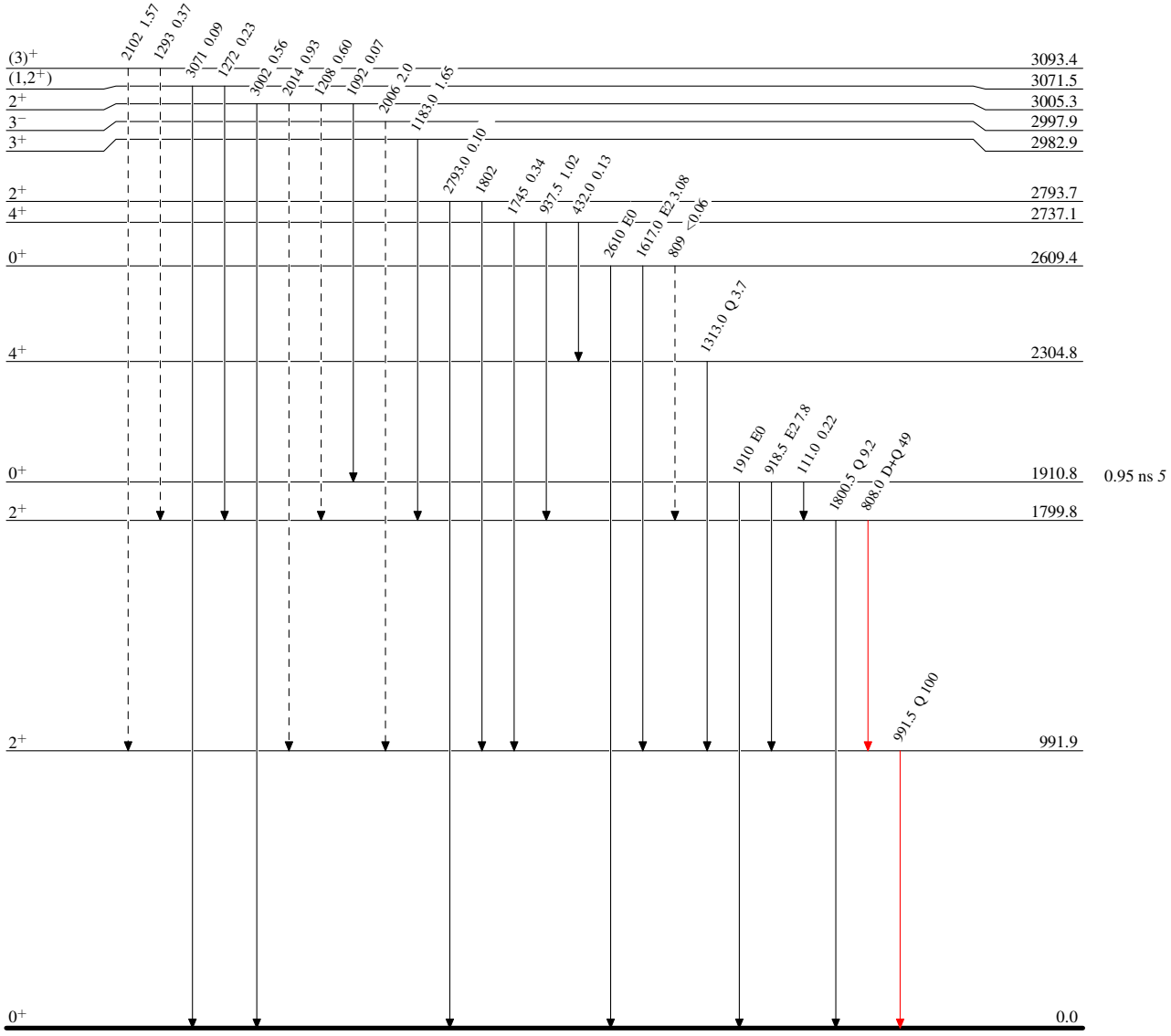


$^{64}_{30}Zn_{34}$

^{64}Zn(p,p′γ) 1975An20,1985Pa07

Level Scheme (continued)

Intensities: Relative I_γ



$^{64}_{30}Zn_{34}$