^{68}Zn(^{12}C,2nγ) E=33-38 MeV 1980Ro02,1993Bi04

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Ameenah R. Farhan, Balraj Singh	NDS 110, 1917 (2009)	30-Jun-2009

Includes inverse kinematic reaction: ^{12}C(^{68}Zn,2nγ).
1980Ro02: Measured Eγ, Iγ, $\gamma\gamma$, $\gamma(\theta)$, γ(linear pol) and lifetimes by DSAM.
1993Bi04: ^{12}C(^{68}Zn,2nγ) E=195 MeV. Measured Eγ, Iγ, $\gamma\gamma$, nγ coin, lifetimes by line-shape analysis, average g factors from precession in $\gamma(\theta$,H) technique.
Other:
1974Sa32: ^{68}Zn(^{12}C,2nγ) At E=32-48 MeV. Measured Eγ, $\gamma(\theta)$, $\gamma\gamma$. Also ^{64}Ni(^{16}O,2nγ) reaction used for $\gamma\gamma$.
Data are from 1980Ro02 In ^{68}Zn(^{12}C,2nγ) reaction unless otherwise stated.

^{78}Kr Levels

E(level)[†]	J$^{\pi}$[‡]	T$_{1/2}$[#]	Comments
0.0[&]	0$^+$		
454.9 *3*	2$^+$	>3.5 ps	
1119.3[&] *3*	4$^+$	2.70 ps *35*	T$_{1/2}$: from line-shape analysis (1993Bi04). Other: 6.2 ps *28* (1980Ro02).
1147.6[a] *3*	2$^+$	>0.6 ps	
1564.3[a] *3*	3$^+$	>1.0 ps	
1653.8 *4*			
1872.6[a] *4*	4$^+$	>2.1 ps	
1977.7[&] *4*	6$^+$	1.25 ps *28*	T$_{1/2}$: 0.83 ps *14* (1993Bi04), line-shape analysis.
2299.2[a] *4*	5$^+$	1.0 ps *+10−3*	
2399[@b]	3$^-$		
2471.8 *4*	(2,3)		
2730.2[a] *5*	(6$^+$)	1.7 ps *9*	
2748.8[b] *4*	5$^-$	0.9 ps *+14−5*	
2764[@c]	(4)$^-$		
2992.9[&] *5*	8$^+$	0.49 ps *14*	T$_{1/2}$: 0.37 ps *5* (1993Bi04), line-shape analysis.
3063.1 *5*	(5)$^-$		
3202.9[a] *5*	(7)$^+$	0.69 ps *28*	
3219.7[c] *4*	(6$^-$)		
3287.8[b] *4*	7$^-$	1.3 ps *8*	
3606.8 *5*	7$^-$	1.0 ps *+14−4*	
3703.9 *5*	(7$^-$)		
3766.2[a] *6*	(8$^+$)	0.24 ps *7*	
3771.1 *5*	(7$^-$)		
3918.3[c] *5*	(8$^-$)	1.39 ps *35*	
4028.2[b] *5*	(9$^-$)	1.5 ps *6*	
4105.3[&] *6*	(10$^+$)	0.33 ps *7*	T$_{1/2}$: 0.42 ps *14* (1993Bi04), effective half-life from line-shape analysis.
4255.3[a] *6*	(9$^+$)	0.35 ps *7*	
4807[@c]	(10$^-$)		
4965.2[b] *6*	(11$^-$)	0.49 ps *7*	
5217.8[&] *6*	12$^+$		

[†] From least-squares fitting to Eγ's, assuming Δ(Eγ)=0.3 keV for Eγ quoted to tenth of a keV, 1 keV otherwise.
[‡] From 'Adopted Levels'.
[#] From DSAM (1980Ro02) unless otherwise noted. Effective half-life indicates upper limit since the correction for side feedings are are not applied.
[@] Level from 1993Bi04.

Continued on next page (footnotes at end of table)

^{68}Zn(^{12}C,2nγ) E=33-38 MeV 1980Ro02,1993Bi04 (continued)

^{78}Kr Levels (continued)

[&] Band(A): g.s. band.
[a] Band(B): γ band.
[b] Band(C): 3^- band.
[c] Band(D): 4^- band.

$\gamma(^{78}Kr)$

E_γ	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ	Comments
351[‡&]		2748.8	5^-	2399	3^-			
417.0	2.1 *4*	1564.3	3^+	1147.6	2^+			A_2=+0.007 *25*, A_4=+0.007 *28*, POL=+0.22 *11*.
455.1	100 *5*	454.9	2^+	0.0	0^+	E2		A_2=+0.240 *10*, A_4=−0.051 *11*, POL=+0.41 *3*. Additional information 1.
456[‡&]		3219.7	(6^-)	2764	$(4)^-$			
470[‡]		3219.7	(6^-)	2748.8	5^-			
534.4	0.5 *1*	1653.8		1119.3	4^+			
539.0	4.5 *11*	3287.8	7^-	2748.8	5^-	E2		Additional information 13. A_2=+0.371 *12*, A_4=−0.096 *13*, POL=+0.56 *14*.
614.0	4 *1*	3606.8	7^-	2992.9	8^+	E1(+M2)	<0.012	A_2=−0.03 *4*, A_4=+0.06 *4*, POL=+0.17 *6*. Mult.: from RUL. 1980Ro02 give δ=+0.07 *4*.
664.4	76 *4*	1119.3	4^+	454.9	2^+	E2		A_2=+0.293 *10*, A_4=−0.076 *11*, POL=+0.48 *4*. Additional information 2.
693.0	9.0 *9*	1147.6	2^+	454.9	2^+	M1+E2	+0.5 *1*	A_2=+0.11 *14*, A_4=−0.01 *15*, POL=+0.12 *5*. Additional information 3.
698.6	4.1 *10*	3918.3	(8^-)	3219.7	(6^-)	E2		Additional information 15. A_2=+0.23 *4*, A_4=−0.09 *4*, POL=+0.55 *11*.
724.8	8.2 *8*	1872.6	4^+	1147.6	2^+	E2		A_2=+0.199 *23*, A_4=−0.057 *25*, POL=+0.60 *11*. Additional information 6.
735.0	5.6 *6*	2299.2	5^+	1564.3	3^+	E2		A_2=+0.187 *18*, A_4=−0.020 *18*, POL=+0.48 *19*.
740.4	9.8 *10*	4028.2	(9^-)	3287.8	7^-	E2		Additional information 16. A_2=+0.29 *9*, A_4=−0.11 *10*, POL=+0.66 *14*.
753.4	3.0 *8*	1872.6	4^+	1119.3	4^+	E2+M1	+3 *+13−2*	A_2=−0.29 *14*, A_4=−0.06 *15*, POL=−0.38 *19*. A_2=+0.36 *8*, A_4=−0.01 *10* (1974Sa32). Sign of A_2 is opposite In 1974Sa32 and 1980Ro02. Additional information 7.
857.6	3.0 *8*	2730.2	(6^+)	1872.6	4^+			
858.4	56 *3*	1977.7	6^+	1119.3	4^+	E2		A_2=+0.294 *11*, A_4=−0.091 *12*, POL=+0.55 *6*. Additional information 8.
890[‡]		4807	(10^-)	3918.3	(8^-)			
903.6	4 *1*	3202.9	$(7)^+$	2299.2	5^+	E2		A_2=+0.098 *15*, A_4=−0.104 *15*, POL=+0.52 *13*.
920.4	1.7 *4*	3219.7	(6^-)	2299.2	5^+	D		A_2=−0.12 *5*, A_4=−0.09 *8*, POL=0.2 *3*. Additional information 11.
937.0	4.0 *10*	4965.2	(11^-)	4028.2	(9^-)	E2		A_2=+0.28 *10*, A_4=−0.14 *11*, POL=+0.33 *22*.
1015.4	27 *1*	2992.9	8^+	1977.7	6^+	E2		A_2=+0.35 *3*, A_4=−0.07 *3*, POL=+0.53 *9*. Additional information 10.
1036	1.3 *3*	3766.2	(8^+)	2730.2	(6^+)			
1052.4	3.0 *8*	4255.3	(9^+)	3202.9	$(7)^+$			
1109.2	12 *1*	1564.3	3^+	454.9	2^+	E2+M1		δ: large. A_2=+0.020 *22*, A_4=+0.188 *24*, POL=+0.31 *8*. Additional information 5.
1112.4[@]	12[@] *1*	4105.3	(10^+)	2992.9	8^+	E2		A_2=+0.76 *5*, A_4=−0.21 *5* for doublet.
1112.4[@]	3.5[@] *9*	5217.8	12^+	4105.3	(10^+)			
1147.4	4.1 *10*	1147.6	2^+	0.0	0^+	E2		A_2=+0.29 *3*, A_4=−0.16 *3*, POL=+0.15 *21*. Additional information 4.

Continued on next page (footnotes at end of table)

^{68}Zn(^{12}C,2nγ) E=33-38 MeV 1980Ro02,1993Bi04 (continued)

$\gamma(^{78}Kr)$ (continued)

E_γ	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ	Comments
1179.8	2.2 *4*	2299.2	5^+	1119.3	4^+	E2+M1	+2 *1*	A_2=+0.41 *4*, A_4=+0.18 *6*, POL=+0.09 *23*.
1198.9	2.1 *4*	1653.8		454.9	2^+			A_2=+0.23 *11*, A_4=+0.07 *12*, POL=−0.4 *7*. I_γ: from Iγ(1198.9γ+1199.2γ)=2.5 *3*.
1199[‡]		2764	$(4)^-$	1564.3	3^+			
1242.1	1.3 *3*	3219.7	(6^-)	1977.7	6^+			Additional information 12. A_2=+0.23 *15*, A_4=+0.2 *3*, POL=−0.3 *6*.
1310.1	5.6 *6*	3287.8	7^-	1977.7	6^+	E1(+M2)	−0.06 *7*	Additional information 14. A_2=−0.35 *10*, A_4=+0.08 *11*, POL=+0.52 *16*.
1629	2.0 *5*	3606.8	7^-	1977.7	6^+			
1629.5	6.0 *6*	2748.8	5^-	1119.3	4^+	E1(+M2)	−0.03 *4*	A_2=−0.307 *22*, A_4=+0.044 *24*, POL=+0.51 *12* for a doublet. Additional information 9.
1644[‡]		2764	$(4)^-$	1119.3	4^+			
1726.2	1.1 *3*	3703.9	(7^-)	1977.7	6^+	D		A_2=−0.26 *7*, A_4=+0.12 *8*.
1793.4	0.7 *2*	3771.1	(7^-)	1977.7	6^+	D		A_2=−0.35 *7*, A_4=+0.01 *8*.
1943.8[&]	1.5 *4*	3063.1	$(5)^-$	1119.3	4^+	D		A_2=−0.19 *4*, A_4=+0.06 *5*. Placement is suspect. 1979He18 place this transition from 2399, 3^- level.
1944[‡]		2399	3^-	454.9	2^+			
2016.9	0.7 *1*	2471.8	(2,3)	454.9	2^+	D		A_2=−0.55 *10*, A_4=+0.19 *11*.

[†] At 38 MeV. Uncertainties quoted are 5-10% for strong lines, 25% for weaker lines. The evaluators assign 5% for Iγ>10, 10% for Iγ=5-10 and 25% for Iγ<5.

[‡] From 1993Bi04.

[#] From $\gamma(\theta)$, γ(lin pol) data of 1980Ro02 and RUL (for E2 and M2 transitions).

[@] Multiply placed with intensity suitably divided.

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

^{68}Zn(^{12}C,2nγ) E=33-38 MeV 1980Ro02,1993Bi04

Level Scheme

Intensities: Relative I_γ

@ Multiply placed: intensity suitably divided

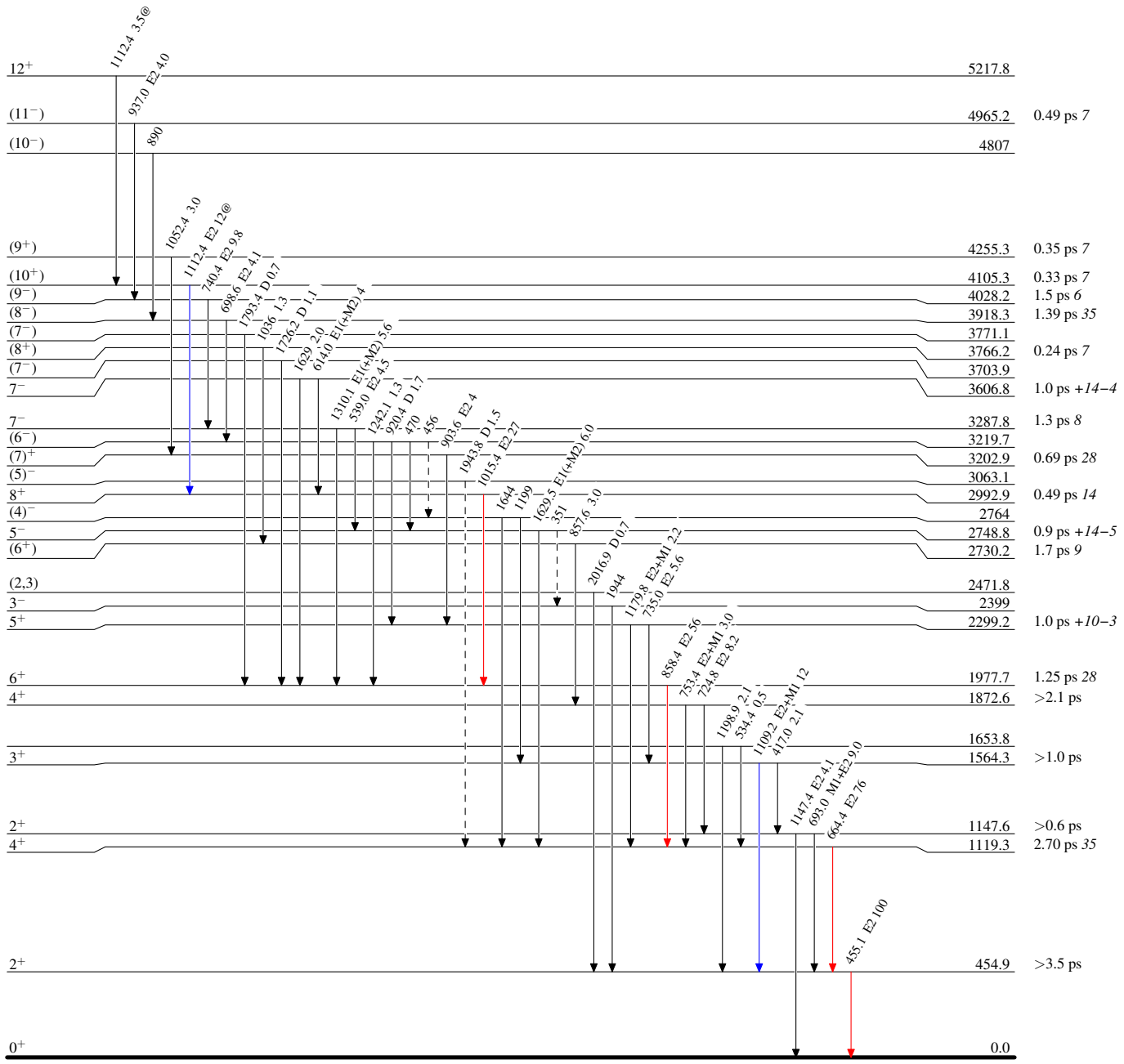
Legend

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

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

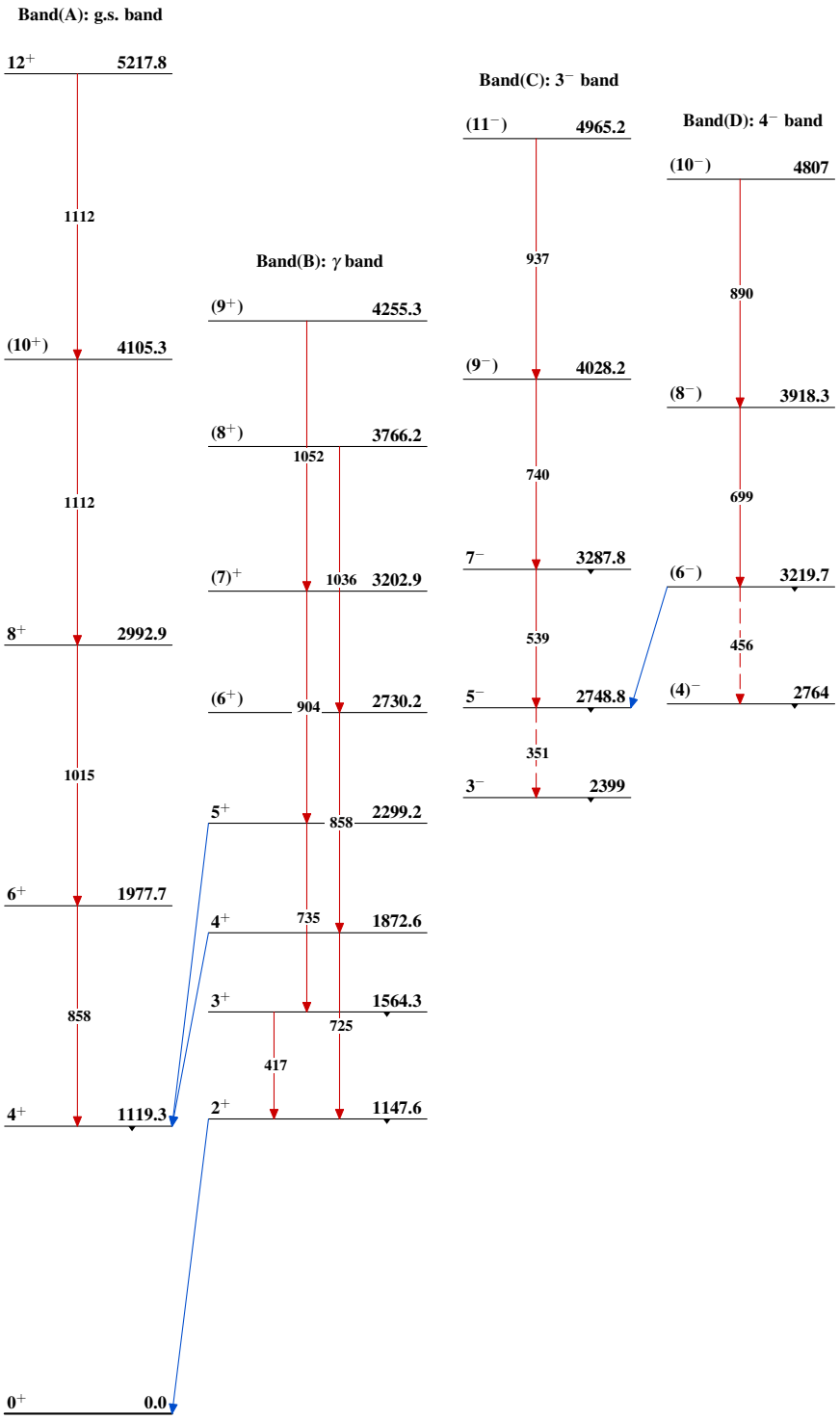
$I_\gamma > 10\% \times I_\gamma^{max}$

γ Decay (Uncertain)



$^{78}_{36}Kr_{42}$

^{68}Zn(^{12}C,2nγ) E=33-38 MeV 1980Ro02,1993Bi04



$^{78}_{36}Kr_{42}$