^{66}Zn(p,nγ) 1994Ti02

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. Browne, J. K. Tuli	NDS 111, 1093 (2010)	3-Mar-2009

1994Ti02: E(p)=6.5-7.1 MeV; measured Eγ, Iγ, γγ coincidences, α(K)exp. Hauser-Feshbach (H-F) analysis.
1971Na15: E(p)=6.00-6.28 MeV; measured Eγ, Iγ, γ-excitation functions, γ(θ), γγ coincidences.
1972He11: E(p)=10 MeV, pulsed beam; measured γ(θ,H,t); deduced $T_{1/2}$, g-factor.
1976Le03: E(p)=6.6 MeV, pulsed beam; measured $T_{1/2}$ by delayed-γ coincidence with beam-burst and γγ-delayed coincidences; g-factor data of 1972He11 reanalyzed.
1974Di14: E(p)=7.5-10 MeV, pulsed beam; measured $T_{1/2}$.
The level scheme is from 1994Ti02. The 140.3, 393.1, 401.4, 530.7, 597.6, 598.9, and 617.1 levels in the level scheme of 1971Na15 were not confirmed by 1994Ti02 and the gamma rays depopulating these levels have been assigned to other levels based on the coincidence data of 1994Ti02. See 1995Fe15 for a theoretical analysis of data in 1994Ti02 and other publications in the framework of interacting boson and boson-fermion models.

^{66}Ga Levels

E(level)†	Jπ‡	$T_{1/2}$	Comments
0.0	0^+		
43.815 *15*	1^+	16 ns *4*	$T_{1/2}$: from (65.1γ)(43.9γ)(t) (1976Le03) $T_{1/2}$=17.3 ns *20* from pulsed-beam delayed-43.9γ coincidence corrected for feeding from 66.3 level (assumed to have $T_{1/2}$=15.4 ns *4*) (1974Di14). Others: uncorrected for feeding: 24.6 ns *20* (1972He11), 23 ns *2* (1976Le03) from pulsed-beam delayed-43.9γ. $T_{1/2}$=25 ns *3* from (96.4γ)(43.9γ)(t) uncorrected for 96.4γ component feeding 66.3 level (1976Le03).
66.152 *18*	$(2)^+$	23 ns *2*	$T_{1/2}$: from pulsed-beam delayed-22.4γ coincidence at E(p)=6.6 MeV. Other: pulsed-beam delayed-22.4γ coincidence measurement at E(p)=7.5-10 MeV, $T_{1/2}$=15.4 ns *4* (1974Di14).
108.894 *14*	1^+		J=1 from γ(θ) of 109γ (1971Na15); π=+ most probable from compound nuclear-statistical model calculations. J=2 from H-F analysis (1994Ti02).
162.481 *19*	$(3)^+$		Jπ: (2) from γ(θ) (1971Na15); J=3 from H-F analysis (1994Ti02).
234.036 *17*	2^+		Jπ: 1,2 from γ(θ) (1971Na15); J=2 from H-F analysis (1994Ti02).
290.922 *23*	$(0,1)^+$		Jπ: 1,2 from γ(θ) (1971Na15); J=0,4 from H-F analysis (1994Ti02).
335.411 *20*	$(2)^+$		Jπ: 2 from γ(θ) (1971Na15); J=1 from H-F analysis of E(p)=6.7 data, J=2 from H-F analysis of E(p)=6.9, 7.1 MeV data (1994Ti02).
381.866 *18*	1^+		J=1 consistent with γ(θ) (1971Na15); J=1 from H-F analysis (1994Ti02).
415.35 *3*	$(4)^+$		J=4 from H-F analysis (1994Ti02).
423.78 *3*	$(3)^+$		J=3 from H-F analysis (1994Ti02).
459.882 *21*	2^+		Jπ: 2 from γ(θ) (1971Na15); J=2 from H-F analysis (1994Ti02).
516.21 *3*	$(4)^+$		J=4 from H-F analysis (1994Ti02).
536.627 *19*	1^+		J=1,2 from H-F analysis (1994Ti02).
552.90 *3*	$(3)^+$		Jπ: 2,3 consistent with γ(θ) (1971Na15); J=3 from H-F analysis (1994Ti02).
620.986 *25*	$(2)^+$		J=1,2 from H-F analysis (1994Ti02).
639.59 *3*	$(3)^+$		J=3 from H-F analysis (1994Ti02).
664.210 *24*	$(1,2)^+$		J=1,2 from H-F analysis (1994Ti02).
706.059 *25*	1^+		J=1,2 from H-F analysis (1994Ti02).
721.90 *3*	$(3)^+$		J=3 from H-F analysis (1994Ti02).
790.09 *3*	$(1,2)^+$		J=1,2 from H-F analysis (1994Ti02).
838.94 *3*			
845.04 *5*	$(2^+,3,4^+)$		
863.56 *6*	(5)		
866.23 *4*	1^+		
943.87 *5*	$(2^+,3,4^+)$		
974.48 *4*	$(1,2^+)$		
998.63 *6*	$(1^+,2,3^+)$		
1018.32 *17*			
1065.16 *19*	$(1^+,2,3^+)$		
1081.2 *4*			

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^{66}Zn(p,nγ) 1994Ti02 (continued)

^{66}Ga Levels (continued)

† From least-squares fit to Eγ data.
‡ From Adopted Levels. Supporting arguments from this data set are indicated.

γ(^{66}Ga)

γγ coincidence data are from 1994Ti02.

E_γ[†]	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult.	δ	Comments
22.33 *5*	15 *5*	66.152	(2)$^+$	43.815	1$^+$			
42.69 *8*	3.1 *10*	108.894	1$^+$	66.152	(2)$^+$	[M1]		
43.81 *3*	100 *10*	43.815	1$^+$	0.0	0$^+$			
65.09 *2*	10.9 *7*	108.894	1$^+$	43.815	1$^+$	(M1+E2)	<0.04	Mult.,δ: from Adopted Gammas.
71.51 *4*	0.60 *8*	234.036	2$^+$	162.481	(3)$^+$	[D]		
91.06 *6*	0.13 *6*	381.866	1$^+$	290.922	(0,1)$^+$	[M1]		
96.34 *2*	30.3 *16*	162.481	(3)$^+$	66.152	(2)$^+$	D[@]		α(K)exp=0.059 *17* E_γ: intensity ratios of 96γ with other gammas in coincidence spectra by 1994Ti02 do not support the doublet nature of this γ noted by 1971Na15. Mult.: (D+Q) for the 96γ with −0.5<δ<0 for a 2$^+$ to 1$^+$ transition (1971Na15).
101.0 *3*	[#]	516.21	(4)$^+$	415.35	(4)$^+$			
108.90 *2*	19.4 *11*	108.894	1$^+$	0.0	0$^+$	D[@]		α(K)exp=0.047 *9*
118.80 *10*	[#]	162.481	(3)$^+$	43.815	1$^+$			
124.54 *10*	0.16 *6*	459.882	2$^+$	335.411	(2)$^+$			
125.15 *3*	1.38 *12*	234.036	2$^+$	108.894	1$^+$	M1+E2[@]		α(K)exp=0.040 *7* δ: <0.24 from α(K)exp (1994Ti02).
132.86 *9*	0.08 *5*	838.94		706.059	1$^+$			
137.56 *4*	0.36 *7*	552.90	(3)$^+$	415.35	(4)$^+$			
147.78 *5*	0.18 *6*	381.866	1$^+$	234.036	2$^+$			
150.68 *7*	0.12 *6*	790.09	(1,2)$^+$	639.59	(3)$^+$			
154.80 *9*	0.10 *6*	536.627	1$^+$	381.866	1$^+$			
169.29 *17*	0.09 *7*	706.059	1$^+$	536.627	1$^+$	[M1]		
172.95 *3*	0.73 *9*	335.411	(2)$^+$	162.481	(3)$^+$	M1+E2[@]		α(K)exp=0.0153 *31* δ: <0.25 from α(K)exp (1994Ti02).
182.06 *3*	8.0 *5*	290.922	(0,1)$^+$	108.894	1$^+$	M1+E2[@]		α(K)exp=0.0131 *24* δ: −0.22 *12* for J(291)=1; +0.20 *4* if J(291)=2 (1971Na15); <0.23 from α(K)exp (1994Ti02).
189.91 *10*	0.82 *11*	423.78	(3)$^+$	234.036	2$^+$			
190.21 *2*	23.0 *14*	234.036	2$^+$	43.815	1$^+$	M1+E2[@]		α(K)exp=0.0118 *21* δ: +0.11 *3* if J(234)=2, −1.2 *7* if J(234)=1 (1971Na15); <0.24 from α(K)exp (1994Ti02).
201.95 *13*	0.10 *6*	866.23	1$^+$	664.210	(1,2)$^+$			
215.94 *17*	0.07 *5*	639.59	(3)$^+$	423.78	(3)$^+$			
217.53 *13*	0.07 *5*	552.90	(3)$^+$	335.411	(2)$^+$			
224.29 *11*	0.13 *6*	639.59	(3)$^+$	415.35	(4)$^+$			
225.82 *11*	0.24 *6*	459.882	2$^+$	234.036	2$^+$			
226.50 *3*	2.8 *2*	335.411	(2)$^+$	108.894	1$^+$	M1+E2[@]	+0.09 *3*	α(K)exp=0.0076 *14* δ: from γ(θ) by 1971Na15; <0.28 from α(K)exp (1994Ti02).

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^{66}Zn(p,nγ) 1994Ti02 (continued)

γ(^{66}Ga) (continued)

Eγ[†]	Iγ[‡]	Ei(level)	J_i^π	Ef	J_f^π	Mult.	δ	Comments
233.98 *4*	0.29 *7*	234.036	2+	0.0	0+	E2[@]		α(K)exp=0.024 *7*
245.70 *3*	2.01 *16*	536.627	1+	290.922	(0,1)+	M1[@]		α(K)exp=0.0063 *12*
246.1 *4*	[#]	706.059	1+	459.882	2+			
247.08 *6*	0.26 *7*	290.922	(0,1)+	43.815	1+			
252.89 *3*	5.9 *4*	415.35	(4)+	162.481	(3)+	M1[@]		α(K)exp=0.0060 *11*
253.46 *14*	0.17 *6*	790.09	(1,2)+	536.627	1+			
261.30 *3*	3.8 *3*	423.78	(3)+	162.481	(3)+	M1[@]		α(K)exp=0.0054 *11*
269.27 *3*	2.8 *3*	335.411	(2)+	66.152	(2)+	M1+E2[@]		α(K)exp=0.0047 *9* δ: +0.18 *6* or +1.40 *15* (1971Na15); <0.28 from α(K)exp (1994Ti02).
272.96 *3*	2.5 *2*	381.866	1+	108.894	1+	M1+E2[@]	+0.24 *10*	α(K)exp=0.0048 *9* δ: from γ(θ) by 1971Na15; <0.34 from α(K)exp (1994Ti02).
285.65 *7*	0.13 *6*	620.986	(2)+	335.411	(2)+			
291.59 *3*	8.1 *5*	335.411	(2)+	43.815	1+	M1+E2[@]	+0.04 *4*	α(K)exp=0.0039 *7* δ: from γ(θ) by 1971Na15; <0.30 from α(K)exp (1994Ti02).
297.38 *5*	0.31 *7*	459.882	2+	162.481	(3)+			
302.18 *14*	0.73 *13*	838.94		536.627	1+			
302.44 *6*	1.06 *13*	536.627	1+	234.036	2+			
304.16 *4*	0.66 *9*	639.59	(3)+	335.411	(2)+			
318.85 *3*	2.07 *16*	552.90	(3)+	234.036	2+	M1+E2[@]		α(K)exp=0.0030 *7* δ: −0.75 *15* if J(553)=2; 0.0 *1* if J(553)=3 (1971Na15); <0.32 from α(K)exp (1994Ti02).
324.00 *13*	0.10 *6*	706.059	1+	381.866	1+			
328.80 *12*	0.46 *8*	664.210	(1,2)+	335.411	(2)+			
330.10 *4*	0.65 *9*	790.09	(1,2)+	459.882	2+			
338.05 *3*	2.09 *16*	381.866	1+	43.815	1+	M1+E2[@]	−0.05 *9*	α(K)exp=0.0030 *7* δ: from γ(θ) by 1971Na15; <0.53 from α(K)exp (1994Ti02).
347.31 *19*	[#]	863.56	(5)	516.21	(4)+			
349.16 *21*	0.24 *8*	415.35	(4)+	66.152	(2)+			
351.01 *3*	2.36 *17*	459.882	2+	108.894	1+	M1+E2[@]		α(K)exp=0.0024 *5* δ: <0.34 from α(K)exp (1994Ti02).
353.75 *3*	3.5 *2*	516.21	(4)+	162.481	(3)+	M1+E2[@]		α(K)exp=0.0025 *5* δ: <0.41 from α(K)exp (1994Ti02).
357.62 *3*	3.4 *2*	423.78	(3)+	66.152	(2)+	M1[@]		α(K)exp=0.0024 *5*
370.9 *5*	[#]	706.059	1+	335.411	(2)+			
381.85 *3*	6.6 *4*	381.866	1+	0.0	0+	M1[@]		α(K)exp=0.00208 α(K)exp value used to normalize the α spectrum.
386.43 *19*	0.32 *8*	721.90	(3)+	335.411	(2)+			
386.85 *5*	1.47 *13*	620.986	(2)+	234.036	2+	M1[@]		α(K)exp=0.0020 *4*
390.44 *5*	0.83 *9*	552.90	(3)+	162.481	(3)+	M1[@]		α(K)exp=0.0022 *5*
393.67 *4*	0.82 *9*	459.882	2+	66.152	(2)+	M1[@]		α(K)exp=0.0019 *4*
405.65 *10*	0.12 *6*	639.59	(3)+	234.036	2+			
408.15 *23*	0.07 *6*	790.09	(1,2)+	381.866	1+			
415.13 *19*	0.24 *6*	706.059	1+	290.922	(0,1)+			
416.02 *3*	7.0 *5*	459.882	2+	43.815	1+	M1+E2[@]		α(K)exp=0.0016 *3* δ: <0.36 from α(K)exp (1994Ti02).

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^{66}Zn(p,nγ) 1994Ti02 (continued)

γ(^{66}Ga) (continued)

Eγ†	Iγ‡	Ei(level)	J^π_i	Ef	J^π_f	Mult.	Comments
427.55 *23*	#	943.87	(2+,3,4+)	516.21	(4)+		
427.78 *7*	0.19 *6*	536.627	1+	108.894	1+		
429.82 *10*	0.40 *7*	845.04	(2+,3,4+)	415.35	(4)+		
430.11 *19*	#	664.210	(1,2)+	234.036	2+		
448.23 *5*	0.62 *8*	863.56	(5)	415.35	(4)+		
449.99 *5*	0.40 *7*	516.21	(4)+	66.152	(2)+		
457.04 *21*	0.25 *6*	838.94		381.866	1+		
458.52 *4*	1.52 *13*	620.986	(2)+	162.481	(3)+	M1@	α(K)exp=0.0014 *3*
461.96 *15*	0.20 *7*	998.63	(1+,2,3+)	536.627	1+		
470.47 *3*	3.1 *2*	536.627	1+	66.152	(2)+		
472.01 *5*	2.4 *2*	706.059	1+	234.036	2+		
477.12 *3*	3.7 *3*	639.59	(3)+	162.481	(3)+	M1@	α(K)exp=0.0011 *2*
484.25 *12*	0.21 *6*	866.23	1+	381.866	1+		
486.75 *7*	2.7 *2*	552.90	(3)+	66.152	(2)+	M1@	α(K)exp=0.0012 *2*
487.93 *8*	1.21 *13*	721.90	(3)+	234.036	2+		
492.84 *8*	0.27 *7*	536.627	1+	43.815	1+		
501.66 *5*	0.39 *8*	664.210	(1,2)+	162.481	(3)+		
530.74 *17*	0.42 *8*	866.23	1+	335.411	(2)+		
536.64 *3*	2.6 *2*	536.627	1+	0.0	0+	M1@	α(K)exp=0.0010 *2*
555.39 *26*	0.69 *9*	664.210	(1,2)+	108.894	1+		
556.16 *25*	0.42 *12*	790.09	(1,2)+	234.036	2+		
559.40 *5*	0.60 *9*	721.90	(3)+	162.481	(3)+		
573.46 *5*	0.87 *13*	639.59	(3)+	66.152	(2)+	M1+E2@	α(K)exp=0.0010 *2* δ: <2.4 from α(K)exp (1994Ti02).
575.0 *3*	0.17 *9*	998.63	(1+,2,3+)	423.78	(3)+		
575.3 *3*	0.50 *9*	866.23	1+	290.922	(0,1)+		
577.18 *3*	4.1 *4*	620.986	(2)+	43.815	1+	M1@	α(K)exp=0.00080 *16*
597.6 *3*	0.20 *8*	706.059	1+	108.894	1+		
598.06 *3*	3.2 *3*	664.210	(1,2)+	66.152	(2)+	M1@	α(K)exp=0.00073 *14*
602.82 *19*	0.21 *11*	1018.32		415.35	(4)+		
608.1 *3*	#	943.87	(2+,3,4+)	335.411	(2)+		
611.03 *8*	0.36 *8*	845.04	(2+,3,4+)	234.036	2+		
620.41 *3*	2.0 *2*	664.210	(1,2)+	43.815	1+	M1@	α(K)exp=0.00074 *14*
639.9 *5*	0.39 *10*	706.059	1+	66.152	(2)+		
655.75 *3*	1.8 *2*	721.90	(3)+	66.152	(2)+	M1@	α(K)exp=0.00053 *14*
661.9 *3*	0.12 *6*	706.059	1+	43.815	1+		
664.15 *18*	0.10 *6*	664.210	(1,2)+	0.0	0+		
681.07 *6*	0.35 *7*	790.09	(1,2)+	108.894	1+		
682.5 *3*	#	845.04	(2+,3,4+)	162.481	(3)+		
683.1 *3*	#	1065.16	(1+,2,3+)	381.866	1+		
683.55 *14*	#	974.48	(1,2+)	290.922	(0,1)+		
699.2 *4*	#	1081.2		381.866	1+		
700.94 *15*	0.12 *4*	863.56	(5)	162.481	(3)+		
706.07 *3*	2.8 *3*	706.059	1+	0.0	0+	M1@	α(K)exp=0.00053 *12*
709.75 *9*	0.25 *8*	943.87	(2+,3,4+)	234.036	2+		
724.00 *3*	3.6 *4*	790.09	(1,2)+	66.152	(2)+	M1@	α(K)exp=0.00047 *11*
730.03 *3*	0.66 *9*	838.94		108.894	1+		
730.1 *5*	#	1065.16	(1+,2,3+)	335.411	(2)+		
740.53 *8*	0.27 *7*	974.48	(1,2+)	234.036	2+		
746.24 *8*	0.23 *7*	790.09	(1,2)+	43.815	1+		
757.38 *5*	2.9 *3*	866.23	1+	108.894	1+	M1,E2@	α(K)exp=0.00048 *12*

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$^{66}Zn(p,n\gamma)$ 1994Ti02 (continued)

$\gamma(^{66}Ga)$ (continued)

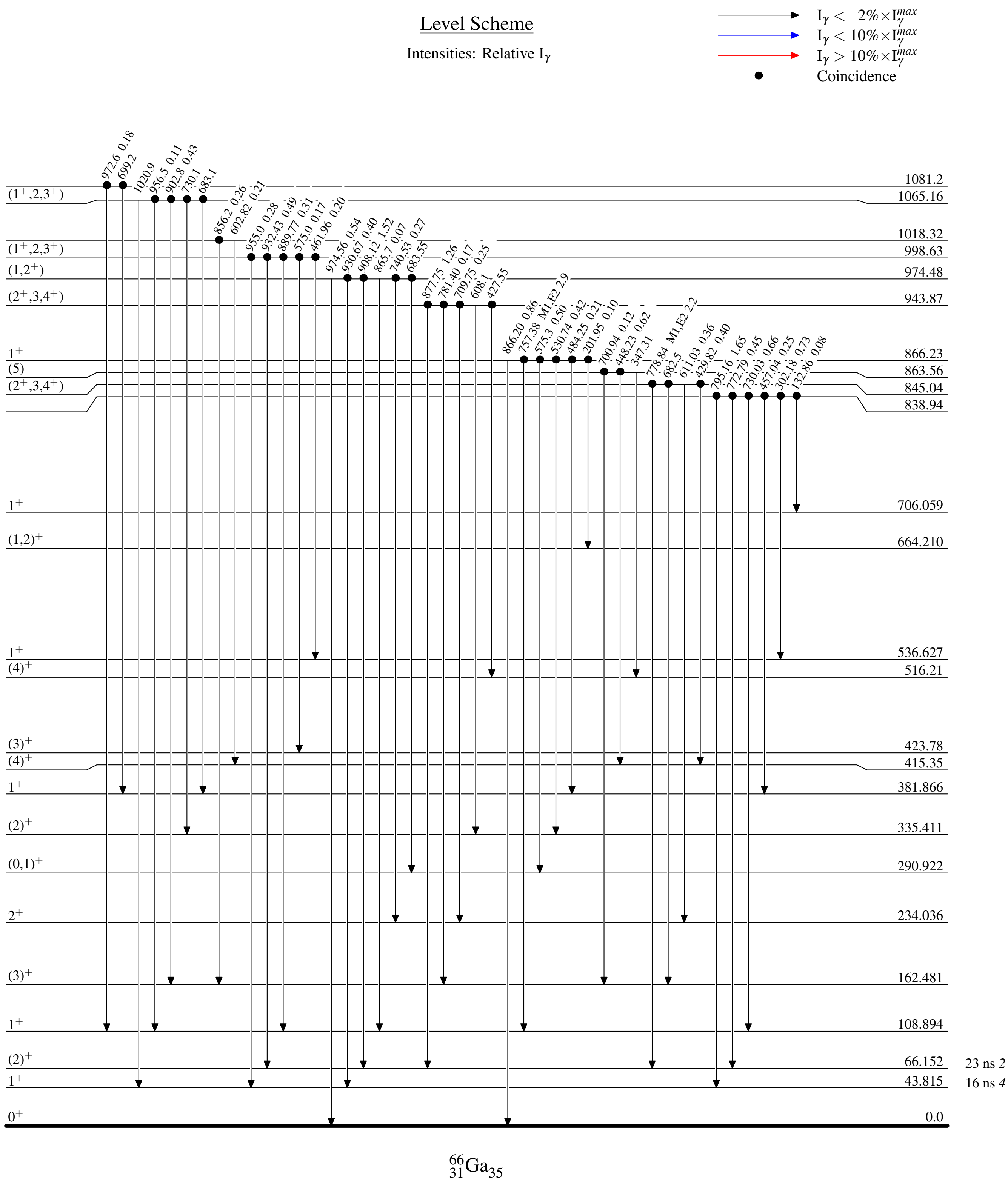
E_γ†	I_γ‡	E_i(level)	J^π_i	E_f	J^π_f	Mult.	Comments
772.79 *10*	0.45 *8*	838.94		66.152	$(2)^+$		
778.84 *5*	2.2 *2*	845.04	$(2^+,3,4^+)$	66.152	$(2)^+$	M1,E2@	α(K)exp=0.00046 *13*
781.40 *17*	0.17 *7*	943.87	$(2^+,3,4^+)$	162.481	$(3)^+$		
795.16 *5*	1.65 *15*	838.94		43.815	1^+		
856.2 *3*	0.26 *13*	1018.32		162.481	$(3)^+$		
865.7 *4*	0.07 *6*	974.48	$(1,2^+)$	108.894	1^+		
866.20 *6*	0.86 *10*	866.23	1^+	0.0	0^+		
877.75 *5*	1.26 *12*	943.87	$(2^+,3,4^+)$	66.152	$(2)^+$		
889.77 *10*	0.31 *7*	998.63	$(1^+,2,3^+)$	108.894	1^+		
902.8 *4*	0.43 *8*	1065.16	$(1^+,2,3^+)$	162.481	$(3)^+$		
908.12 *8*	1.52 *14*	974.48	$(1,2^+)$	66.152	$(2)^+$		
930.67 *11*	0.40 *8*	974.48	$(1,2^+)$	43.815	1^+		
932.43 *9*	0.49 *9*	998.63	$(1^+,2,3^+)$	66.152	$(2)^+$		
955.0 *5*	0.28 *8*	998.63	$(1^+,2,3^+)$	43.815	1^+		
956.5 *5*	0.11 *6*	1065.16	$(1^+,2,3^+)$	108.894	1^+		
972.6 *5*	0.18 *6*	1081.2		108.894	1^+		
974.56 *7*	0.54 *8*	974.48	$(1,2^+)$	0.0	0^+		
1020.9 *6*	#	1065.16	$(1^+,2,3^+)$	43.815	1^+		

† From 1994Ti02, unless indicated otherwise.
‡ Relative from 1994Ti02, unless indicated otherwise.
# Weak γ ray.
@ From α(K)exp (1994Ti02).

^{66}Zn(p,nγ) 1994Ti02

Level Scheme

Intensities: Relative I_γ



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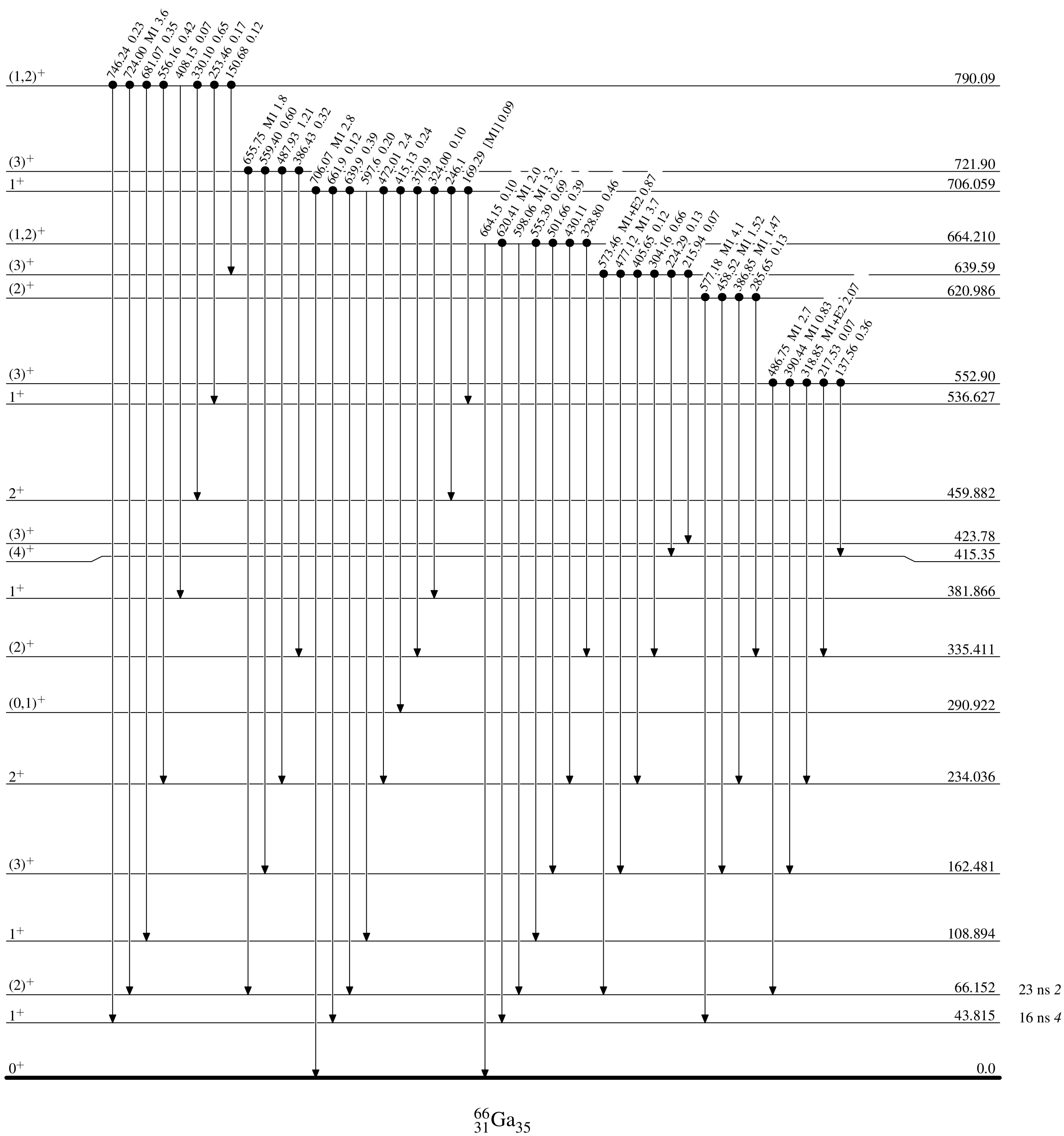
Level Scheme (continued)

Intensities: Relative I_γ

Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- Coincidence



$^{66}_{31}Ga_{35}$

^{66}Zn(p,nγ) 1994Ti02

Level Scheme (continued)

Intensities: Relative I_γ

Legend

$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$
Coincidence