^{91}Zr(α,nγ) 2003Fr02

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	D. Abriola(a), A. A. Sonzogni	NDS 107, 2423 (2006)	1-Jan-2006

E=15 MeV. Measured Eγ, Iγ, and $\gamma\gamma$ using the OSIRIS cube detectors, coincidence spectrometer comprised of ten HPGe of which six were Compton-suppressed. Also E=12 MeV. Measured Eγ, Iγ, $\gamma\gamma$, $\gamma\gamma(\theta)$ and lifetimes by the Doppler-shift attenuation method using the OSIRIS spectrometer comprised of five BGO Compton-suppressed detectors and one Euroball cluster detector.

^{94}Mo Levels

E(level)[#]	J$^\pi$	T$_{1/2}$[†]	E(level)[#]	J$^\pi$	T$_{1/2}$[†]
0[@]	0^+		3165.86 *12*	6^+	322[‡] fs *35*
871.18[@] *6*	2^+		3201.19 *24*	(4)	44 fs *+6−5*
1573.85[@] *9*	4^+		3243.3 *5*	(5^+)	92 fs *+16−15*
1864.37 *8*	2^+	0.28 ps *+6−5*	3307.2 *4*	2^+	0.40 ps *+14−9*
2067.40 *7*	2^+	35 fs *3*	3320.8 *3*	(9^+)	>0.69[‡] ps
2294.88 *17*	4^+	76 fs *11*	3331.82 *18*	(3^+)	52 fs *6*
2393.07 *7*	2^+	83 fs *+12−10*	3339.74 *16*	6^+	126[‡] fs *21*
2423.54[@] *12*	6^+	>312 fs	3366.5 *4*	$(3^+,4)$	0.61[‡] ps *7*
2533.92 *14*	3^-	0.52 ps *+9−8*	3367.2[&] *7*	$(5,7^-)$	>0.69[‡] ps
2565.06 *21*	4^+	0.16 ps *+5−3*	3389.5 *5*	$5^{(-)}$	0.49[‡] ps *12*
2610.67[&] *21*	5^-	0.44 ps *+11−8*	3398.4 *4*	(3,4)	35 fs *+7−6*
2767.69 *19*	4^+	107 fs *12*	3447.7 *4*	(2)	35 fs *+5−4*
2805.12 *20*	3^+	0.35 ps *+5−4*	3448.8 *4*	(5^+)	0.45[‡] ps *14*
2835.0 *3*	(4^-)	>0.69 ps	3534.37 *11*	2^+	105[‡] fs *28*
2869.95 *9*	2^+	91 fs *10*	3693.5 *5*	(3,4)	0.105[‡] fs *35*
2872.49 *13*	6^+	>0.69[‡] ps	3805.2 *6*	(8,10)	>0.69[‡] ps
2955.64[@] *16*	(8^+)		3847.4 *7*	(2,3,4)	136[‡] fs *28*
2965.48 *8*	3^+	52 fs *6*	3866.9 *4*	(9^+)	>0.69[‡] ps
2993.16 *20*	2^+	151 fs *+19−17*	3897.6 *10*	$(3^+,5^+)$	78[‡] fs *28*
3011.59 *17*	3^-	0.22 ps *+6−4*	3932.5 *7*	(7^+)	126[‡] fs *21*
3082.53 *25*	(3^+)	0.70 ps *+28−17*	4105.6 *10*		91[‡] fs *28*
3163.37 *20*	(3^+)	63 fs *7*	4237.6 *12*		62[‡] fs *28*

[†] From a combination of (α,nγ) and (n,n$'\gamma$) experiments, unless otherwise stated.
[‡] Effective half-life from (α,nγ) experiment only, not corrected for side feeding.
[#] From least-squares fit to Eγ.
[@] Band(A): g.s. Band.
[&] Band(B): Negative parity Band.

γ(^{94}Mo)

E$_i$(level)	J$_i^\pi$	E$_\gamma$[†]	I$_\gamma$[†]	E$_f$	J$_f^\pi$	Mult.[‡]	δ[‡]
871.18	2^+	871.09 *10*	100	0	0^+		
1573.85	4^+	702.63 *10*	100	871.18	2^+	E2(+M3)	0.00 *4*
1864.37	2^+	993.1 *1*	100.0 *10*	871.18	2^+	M1+E2	−2.0 *10*
		1864.3 *2*	10.3 *10*	0	0^+		
2067.40	2^+	1196.2 *1*	100.0 *7*	871.18	2^+	M1+E2	+0.15 *4*
		2067.4 *1*	15.1 *7*	0	0^+		
2294.88	4^+	721.0 *2*	100.0 *2*	1573.85	4^+	M1(+E2)	+0.03 *4*
		1423.7 *3*	13.3 *2*	871.18	2^+	E2(+M3)	+0.08 *8*

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^{91}Zr(α,nγ) 2003Fr02 (continued)

$\gamma(^{94}Mo)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	δ[‡]	Comments
2393.07	2^+	325.7 *3*	0.61 *14*	2067.40	2^+			
		528.7 *3*	0.72 *3*	1864.37	2^+			
		1521.8 *1*	100.0 *20*	871.18	2^+	M1+E2	−0.12 *3*	
		2393.1 *1*	11.11 *22*	0	0^+			
2423.54	6^+	849.7 *1*	100	1573.85	4^+	E2(+M3)	−0.04 *5*	
2533.92	3^-	466.4 *3*	57.3 *10*	2067.40	2^+	E1(+M2)	0.00 *3*	
		669.6 *2*	31.9 *13*	1864.37	2^+	E1(+M2)	−0.03 *13*	
		960.1 *3*	81 *3*	1573.85	4^+	E1(+M2)	0.00 *2*	
		1662.7 *3*	100.0 *22*	871.18	2^+	E1(+M2)	+0.03 *7*	
2565.06	4^+	991.2 *2*	100.0 *8*	1573.85	4^+	M1(+E2)	+0.10 *+25−17*	
		1693.9 *7*	11.8 *8*	871.18	2^+	E2(+M3)	−0.01 *10*	
2610.67	5^-	1036.8 *2*	100	1573.85	4^+	E1(+M2)	0.00 *4*	
2767.69	4^+	1193.8 *5*	71 *4*	1573.85	4^+			
		1896.5 *2*	100 *4*	871.18	2^+	E2(+M3)	+0.02 *3*	
2805.12	3^+	940.7 *4*	63 *4*	1864.37	2^+	M1+E2	+2.3 *+7−5*	
		1231.2 *3*	100 *5*	1573.85	4^+	M1+E2	+8 *+5−3*	
		1933.9 *4*	76 *3*	871.18	2^+	M1+E2		δ: - 0.66 *14* or - 1.7 *+4−5*.
2835.0	(4^-)	224.2 *5*	7.2 *10*	2610.67	5^-	M1+E2		δ: + 3.3 *+10−19* or + 0.18 *12*.
		301.1 *3*	13.1 *12*	2533.92	3^-	M1+E2	+0.12 *10*	
		1261.1 *5*	100.0	1573.85	4^+	E1(+M2)	+0.06 *7*	
2869.95	2^+	802.6 *2*	26.2 *15*	2067.40	2^+			
		1005.5 *1*	100 *4*	1864.37	2^+	M1+E2	−0.05 *4*	
		1998.9 *2*	13.1 *6*	871.18	2^+	M1+E2	+1.3 *+14−4*	
		2870.0 *2*	17.3 *5*	0	0^+			
2872.49	6^+	449.0 *1*	100	2423.54	6^+	M1+E2	+0.14 *6*	
2955.64	(8^+)	532.1 *1*	100	2423.54	6^+	E2(+M3)	−0.03 *5*	
2965.48	3^+	898.1 *1*	23.0 *12*	2067.40	2^+	M1+E2		δ: + 2.0 *+12−6* or + 0.39 *25*.
		1101.1 *1*	100.0 *23*	1864.37	2^+	M1+E2	−0.09 *6*	
		1391.6 *1*	63.0 *24*	1573.85	4^+	M1+E2	−0.08 *6*	
		2094.3 *1*	36.9 *14*	871.18	2^+	M1+E2	+1.1 *+10−4*	
2993.16	2^+	925.8 *3*	45 *3*	2067.40	2^+	M1(+E2)	−0.07 *+7−6*	
		1128.6 *5*	100 *4*	1864.37	2^+	M1+E2	−3.4 *+7−9*	
		2122.0 *3*	63.7 *15*	871.18	2^+	M1+E2	−2.6 *+6−7*	
		2993.0 *10*	6.8 *9*	0	0^+			
3011.59	3^-	477.5 *5*	50.9 *17*	2533.92	3^-	M1(+E2)	−0.10 *19*	
		944.3 *6*	11.9 *16*	2067.40	2^+			
		1147.3 *5*	11.5 *15*	1864.37	2^+	E1(+M2)	+0.01 *6*	
		1437.6 *5*	37 *3*	1573.85	4^+	E1(+M2)	+0.04 *6*	
		2140.4 *2*	100.0 *23*	871.18	2^+	E1(+M2)	+0.03 *5*	
3082.53	(3^+)	1218.2 *4*	14.2 *21*	1864.37	2^+	M1+E2	+0.09 *5*	
		2211.3 *3*	100.0 *21*	871.18	2^+	M1(+E2)	−0.01 *6*	
3163.37	(3^+)	358.0 *5*	16.7 *13*	2805.12	3^+	M1+E2	−0.35 *12*	
		2292.2 *2*	100.0 *13*	871.18	2^+	M1+E2	+0.17 *4*	
3165.86	6^+	293.4 *1*	79.4 *25*	2872.49	6^+	M1+E2	+0.18 *5*	
		742.2 *2*	29.4 *11*	2423.54	6^+	M1+E2	+0.15 *7*	
		1592.0 *1*	100 *4*	1573.85	4^+	E2(+M3)	−0.01 *6*	
3201.19	(4)	906.3 *2*	100.0 *22*	2294.88	4^+	D(+Q)	0.00 *6*	
		1627.4 *5*	29.4 *22*	1573.85	4^+	D(+Q)	+0.2 *2*	
3243.3	(5^+)	1669.4 *5*	100	1573.85	4^+	M1+E2	+0.71 *14*	
3307.2	2^+	2436.0 *4*	100	871.18	2^+	M1+E2		δ: - 4.0 *+11−24* or + 0.03 *8*.
3320.8	(9^+)	365.2 *3*	100	2955.64	(8^+)	(M1+E2)	+2.2 *3*	
3331.82	(3^+)	1467.3 *3*	48 *3*	1864.37	2^+	M1+E2	+0.3 *+29−2*	
		1758.0 *2*	100 *6*	1573.85	4^+	M1+E2	−0.10 *3*	
		2460.8 *8*	7.4 *11*	871.18	2^+			
3339.74	6^+	916.2 *1*	100	2423.54	6^+	M1(+E2)	+0.02 *7*	
3366.5	$(3^+,4)$	401.1 *5*	24 *4*	2965.48	3^+			

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^{91}Zr(α,nγ) 2003Fr02 (continued)

$\gamma(^{94}Mo)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	δ[‡]	Comments
3366.5	(3$^+$,4)	1071.6 *5*	100 *4*	2294.88	4$^+$			
3367.2	(5,7$^-$)	756.5 *7*	100	2610.67	5$^-$			
3389.5	5$^{(-)}$	1094.6 *5*	100	2294.88	4$^+$	E1(+M2)	−0.01 *3*	
3398.4	(3,4)	1824.5 *4*	100	1573.85	4$^+$			
3447.7	(2)	2576.5 *5*	100.0 *3*	871.18	2$^+$	D+Q		δ: - 1.9 *+5−6* or - 0.08 *10*.
		3447.5 *10*	5.1 *3*	0	0$^+$			
3448.8	(5$^+$)	576.7 *5*	33 *7*	2872.49	6$^+$	M1(+E2)	+0.03 *5*	
		1874.6 *5*	100 *7*	1573.85	4$^+$	M1+E2	−0.75 *25*	
3534.37	2$^+$	1670.0 *1*	56.1 *20*	1864.37	2$^+$	M1(+E2)	+0.15 *19*	
		2663.2 *2*	100.0 *23*	871.18	2$^+$	M1+E2	−0.3 *2*	
		3534.0 *4*	5.1 *6*	0	0$^+$			
3693.5	(3,4)	925.8 *5*	100 *22*	2767.69	4$^+$			
		2822.1 *15*	95 *22*	871.18	2$^+$			
3805.2	(8,10)	484.4 *5*	100	3320.8	(9$^+$)			
3847.4	(2,3,4)	1552.5 *7*	100	2294.88	4$^+$			
3866.9	(9$^+$)	911.3 *4*	100	2955.64	(8$^+$)	(M1+E2)	+6.6 *+33−16*	
3897.6	(3$^+$,5$^+$)	1602.7 *10*	100.0	2294.88	4$^+$			
3932.5	(7$^+$)	1508.9 *7*	100	2423.54	6$^+$	M1+E2		δ: + 2.5 *3* or + 0.38 *4*.
4105.6		1810.7 *10*	100	2294.88	4$^+$			
4237.6		1942.7 *12*	100	2294.88	4$^+$			

[†] From a combination of four experiments: (γ,γ'); ^{94}Tc ε decay; (α,nγ) and (n,n$'\gamma$).
[‡] From a combination of three experiments: ^{94}Tc ε decay; (α,nγ) and (n,n$'\gamma$).

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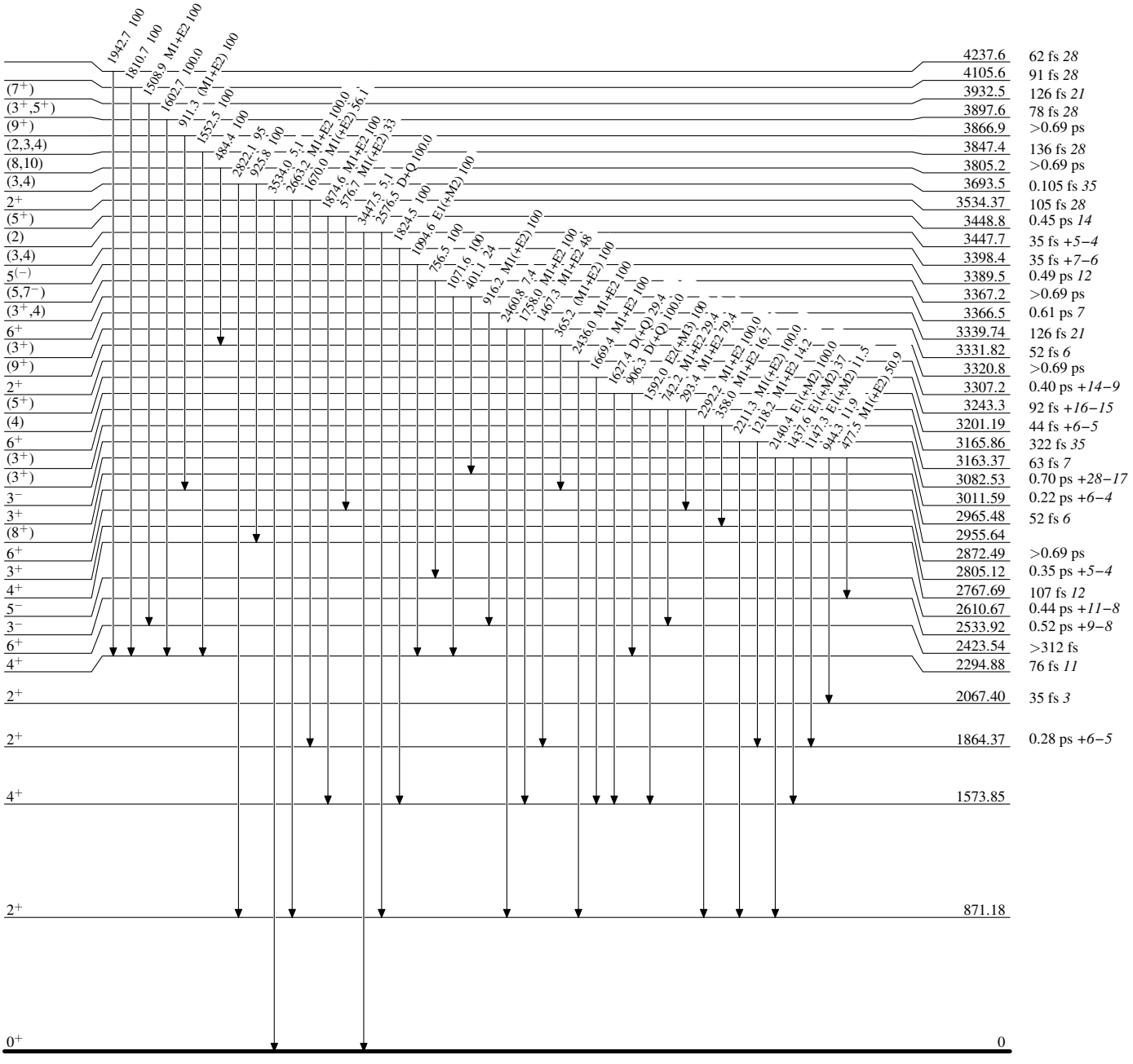
Level Scheme

Intensities: Relative photon branching from each level



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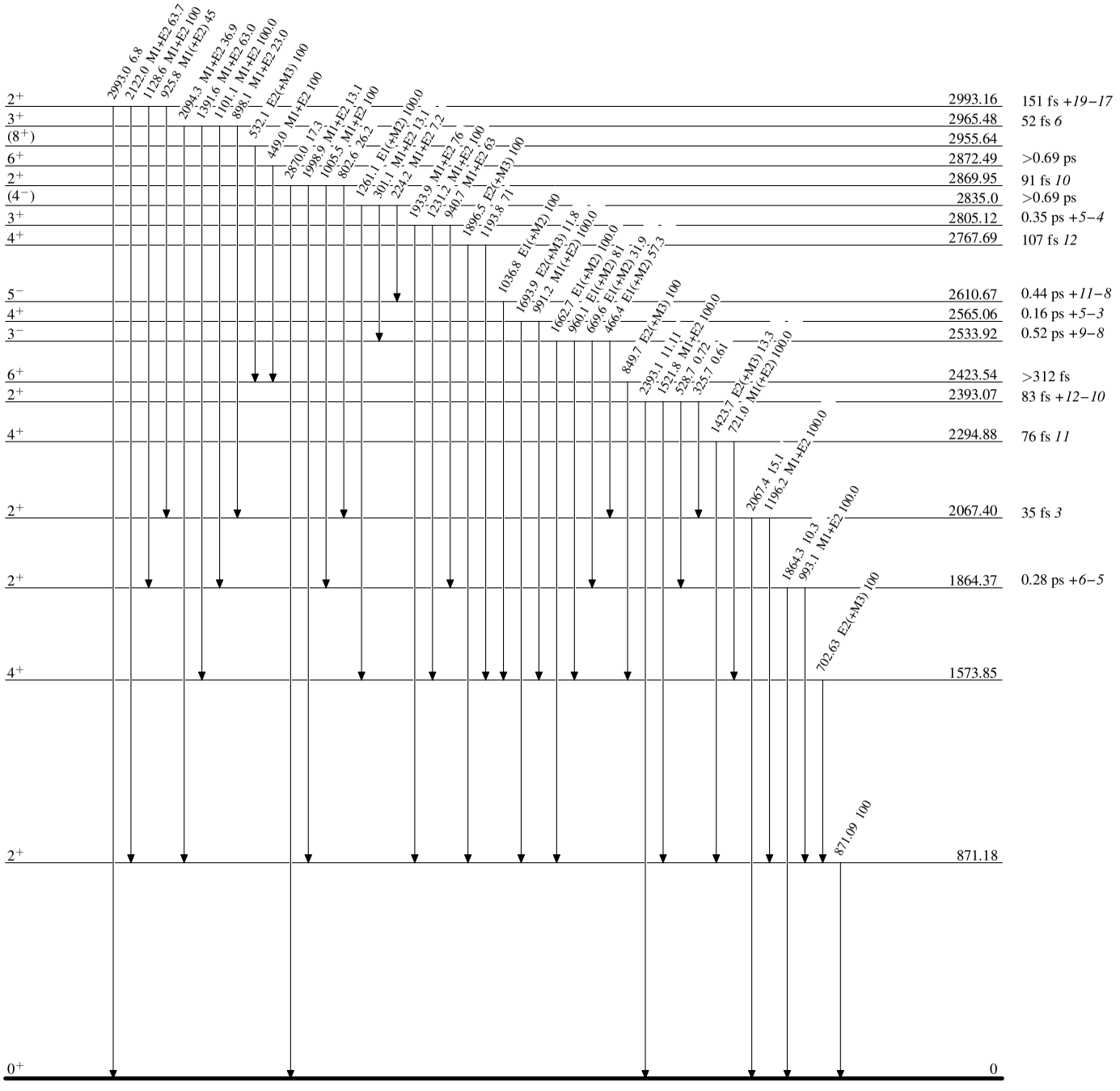
Level Scheme (continued)

Intensities: Relative photon branching from each level



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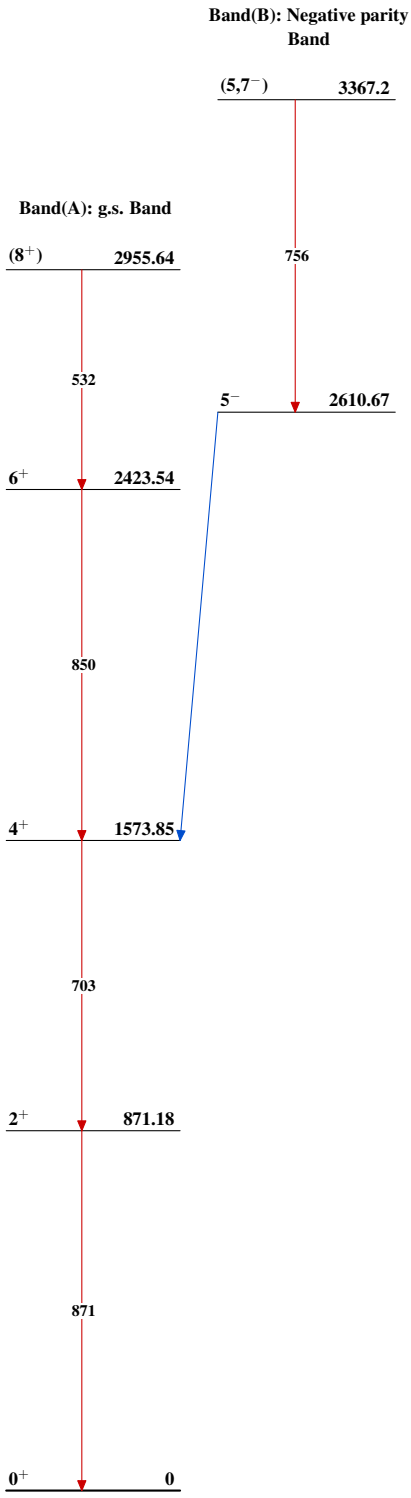

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