^{208}Pb(^{18}O,^{14}Cγ) 2010As03,2010As01

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	K. Auranen and E. A. Mccutchan	NDS 168, 117 (2020)	1-Aug-2020

2010As03, 2010As01: the nuclei of interest were produced in a ^{208}Pb(^{18}O,^{14}Cγ) transfer reaction. The 100-mg/cm^2 thick target stopped the primary beam and reaction products. The ^{18}O beam was provided by the Vivitron tandem of IReS (Strasbourg) laboratory at the energy of 85 MeV. Eγ, Iγ, γ(t), I(x ray) $\gamma\gamma$, γ(x ray) coin, $\gamma\gamma(\theta)$, $\alpha\gamma$-coin, linear polarization were measured with the EUROBALL IV array consisting of 71 Ge detectors, providing a total of 239 crystals grouped in 13 rings. Mean lifetime of states were extracted with the DSAM method using the DESASTOP computer code.

Other: 1981Bo29 observed yrast sequence up to $J^\pi=10^+$ and the 1537-keV level.

^{212}Po Levels

The level scheme adopted here is that proposed in 2010As03.

E(level)[†]	J$^\pi$[‡]	T$_{1/2}$[#]	Comments
0.0[@]	0$^+$		
727.10[@] *10*	2$^+$		
1132.01[@] *14*	4$^+$		%α≈0.5 (2010As03)
1354.62[@] *17*	6$^+$		%α≈3 *1* (2010As03)
1475.1[@] *3*	8$^+$	14.7 ns *3*	%α≈3 *1* (2010As03) T$_{1/2}$: from $\gamma\gamma$(t) (1981Bo29). Other: 14 ns *1* (2010As03).
1536.8 *3*	3$^{(-)}$		
1744.4 *6*	(4$^-$)	0.33 ps *10*	
1751.4 *4*	(8$^-$)	0.33 ps *14*	
1787.1 *4*	(6$^-$)	0.31 ps *6*	
1832.2[@] *3*	10$^+$		
1945.7 *6*	(4$^-$)	0.33 ps *10*	
1986.0 *4*	(8$^-$)		
2002.5 *4*	4$^{(-)}$		
2015.9 *5*	(6$^-$)	0.34 ps *11*	
2085.1 *5*			
2100.9 *5*	5		
2102.9 *3*	5$^{(-)}$		
2170.0 *6*			
2227.7 *5*	7		
2235.8 *5*			
2280.7 *5*			
2295.2 *6*			
2335.2 *5*	9		
2362.6 *5*	(6)		
2374.4 *4*	7$^{(-)}$		
2409.3 *4*	(11$^-$)		
2420.7 *6*			
2432.8 *7*			
2465.5 *20*	10$^{(-)}$	0.42 ps *11*	
2469.7 *4*	(9$^-$)		
2525.4 *11*			
2581.0 *7*			
2604.4 *6*	5		
2604.5 *5*			
2666.7 *20*	5$^{(+)}$	≤0.97 ps	
2700.5 *5*	(12$^+$)		

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^{208}Pb(^{18}O,^{14}Cγ) 2010As03,2010As01 (continued)

^{212}Po Levels (continued)

E(level)†	Jπ‡	$T_{1/2}$#	E(level)†	Jπ‡	$T_{1/2}$#	E(level)†	Jπ‡	$T_{1/2}$#
2769.7 *5*	(13$^-$)		2881.0 *7*			3035.6 *7*		
2780.4 *5*			2881.2 *20*		≤0.38 ps	3111.2 *7*		
2837.2 *11*		≤0.97 ps	2883.0 *6*	(14$^+$)		3154.8 *20*	7$^{(+)}$	0.08 ps *4*
2860.1 *20*		≤0.97 ps	2940.4 *21*			3174.4 *8*		
2861.6 *7*			2974.6 *20*		≤0.97 ps	3193.3 *7*		
2864.6 *20*	7$^{(+)}$	≤0.38 ps	3004.9 *6*			3203.2 *20*		≤0.97 ps
2867.4 *20*	9$^{(+)}$	≤0.97 ps	3011.1 *21*		≤0.97 ps	3209.9 *20*		≤0.97 ps
2877.5 *6*			3023.6 *20*		≤0.97 ps			

† From least-squares fit to Eγ, by evaluators.
‡ As proposed by 2010As01,2010As03 based on multipolarities determined through $\gamma\gamma(\theta)$, $\gamma(\theta)$ and internal conversion coefficient measurements.
# From DSAM (2010As03).
@ Seq.(A): Yrast sequence.

$\gamma(^{212}Po)$

γ-ray anisotropy was determined from the intensities at 39.3° and 76.6° as: $R_{ADO}=I_\gamma(39.3°)/I_\gamma(76.6°)$. Expected values are 1.3 for ΔJ=2, quadrupole and 0.85 for ΔJ=1, dipole transitions.
$\gamma\gamma(\theta)$ measurements for the following cascades: 405-727, 223-405, 577-357, 223-276, 223-432 and 223-461. See Table 4 of 2010As03 for data.
α(K)exp: : estimated from measured I(K x-ray)/Iγ ratios.

E_γ†	I_γ‡	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α[b]	Comments
69.2 *5*	0.6 *3*	2769.7	(13$^-$)	2700.5	(12$^+$)	E1		α(exp)=0.2 *1*
113.3 *5*	0.3 *1*	2883.0	(14$^+$)	2769.7	(13$^-$)	E1		α(exp) < 3.0
120.3 *3*	9.0 *10*	1475.1	8$^+$	1354.62	6$^+$	E2		α(exp)=3.2 *5* R_{ADO}=1.28 *18*.
157.2 *5*	0.4 *2*	2102.9	5$^{(-)}$	1945.7	(4$^-$)			
171.7 *5*	0.5 *2*	2581.0		2409.3	(11$^-$)			
182.6 *5*	0.5 *2*	2883.0	(14$^+$)	2700.5	(12$^+$)	E2		α(exp)=0.6 *3* R_{ADO}=1.37 *16*.
205.1 *5*	0.5 *2*	2432.8		2227.7	7			
222.6 *1*	53 *3*	1354.62	6$^+$	1132.01	4$^+$	E2[a]		α(exp)=0.33 *5* R_{ADO}=1.21 *3*. A_2=+0.18 *3*.
229.8 *5*	0.3 *1*	2604.5		2374.4	7$^{(-)}$			
234.6 *5*	0.4 *2*	1986.0	(8$^-$)	1751.4	(8$^-$)	(D)		R_{ADO}=1.16 *13*.
249.7 *5*	0.3 *1*	2235.8		1986.0	(8$^-$)			
255.2 *5*	0.2 *1*	3035.6		2780.4				
259.6 *5*	0.5 *2*	2362.6	(6)	2102.9	5$^{(-)}$			
264.7 *5*	0.7 *2*	2280.7		2015.9	(6$^-$)			R_{ADO}=0.99 *9*.
276.1 *20*	5.8 *10*	1751.4	(8$^-$)	1475.1	8$^+$	(E1)	0.37 *7*	α(exp)=0.37 *7*; α(K)exp≈0.4 Mult.,α: α(exp) suggest M1+E2 with with δ≈1, however, this is rejected by RUL. Only E1 is allowed when compared with RUL. 2010As03 state that the conversion coefficients are anomalous as they are emitted from states with very large dipole moments.

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^{208}Pb(^{18}O,^{14}Cγ) 2010As03,2010As01 (continued)

γ(^{212}Po) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α[b]	Comments
								R_{ADO}=1.28 *7*. A_2=+0.29 *6*. α: measured value.
291.4 *5*	0.3 *2*	3174.4		2883.0	(14^+)			
310.8 *5*	0.3 *2*	2780.4		2469.7	(9^-)			
315.5 *5*	0.3 *2*	2102.9	$5^{(-)}$	1787.1	(6^-)			
357.1 *1*	17.0 *20*	1832.2	10^+	1475.1	8^+	Q		R_{ADO}=1.26 *3*. A_2=+0.24 *4*.
358.5 *5*	1.1 *3*	2102.9	$5^{(-)}$	1744.4	(4^-)			
358.6 *5*	1.1 *3*	2374.4	$7^{(-)}$	2015.9	(6^-)	D		R_{ADO}=0.85 *10*.
360.2 *5*	1.0 *3*	2769.7	(13^-)	2409.3	(11^-)	Q		R_{ADO}=1.26 *15*.
371.0 *5*	0.3 *1*	2780.4		2409.3	(11^-)			
397.7[#] *20*	0.9 *3*	2867.4	$9^{(+)}$	2469.7	(9^-)	D		Mult.: Q or higher multipolarity would lead to unexpectedly large B($\sigma\lambda$) values.
404.9 *1*	92.4 *25*	1132.01	4^+	727.10	2^+	E2[a]		R_{ADO}=1.19 *2*. A_2=+0.20 *4*.
405 *1*	0.6 *3*	1536.8	$3^{(-)}$	1132.01	4^+			
406.6[#] *20*	0.2 *1*	3011.1		2604.5		(D)		Mult.: Q or higher multipolarity would lead to unexpectedly large B($\sigma\lambda$) values.
410.7 *5*	0.2 *1*	3111.2		2700.5	(12^+)			R_{ADO}=1.08 *16*.
432.3 *20*	7.5 *10*	1787.1	(6^-)	1354.62	6^+	(E1)	0.13 *3*	α(exp)=0.13 *3*; α(K)exp≈0.1 Mult.,α: α(exp) suggest M1+E2 with with δ≈1, however, this is rejected by RUL. Only E1 is allowed when compared with RUL. 2010As03 state that the conversion coefficients are anomalous as they are emitted from states with very large dipole moments. R_{ADO}=1.22 *6*. A_2=+0.27 *7*. α: measured value.
452.3 *5*	0.4 *2*	2861.6		2409.3	(11^-)			
465.7 *3*	5.0 *5*	2002.5	$4^{(-)}$	1536.8	$3^{(-)}$	D[@]		R_{ADO}=0.89 *9*. A_2=−0.5 *1*.
474.9 *5*	0.3 *1*	2940.4		2465.5	$10^{(-)}$			
483.7 *5*	0.4 *2*	2469.7	(9^-)	1986.0	(8^-)			
484.5 *5*	0.7 *3*	2235.8		1751.4	(8^-)			
490.2[#] *20*	0.5 *2*	2864.6	$7^{(+)}$	2374.4	$7^{(-)}$	D		R_{ADO}=1.26 *15*. Mult.: Q or higher multipolarity would lead to unexpectedly large B($\sigma\lambda$) values.
492.8 *5*	0.2 *1*	3193.3		2700.5	(12^+)			
502.9 *5*	0.3 *1*	2335.2	9	1832.2	10^+			
510.9 *5*	2.6 *5*	1986.0	(8^-)	1475.1	8^+	(D)		R_{ADO}=1.10 *9*.
518.4 *5*	0.3 *1*	2881.0		2362.6	(6)			
563.8[#] *20*	1.0 *3*	2666.7	$5^{(+)}$	2102.9	$5^{(-)}$	(D)		Mult.: Q or higher multipolarity would lead to unexpectedly large B($\sigma\lambda$) values.
566.3 *5*	1.4 *3*	2102.9	$5^{(-)}$	1536.8	$3^{(-)}$	Q		R_{ADO}=1.32 *14*.
575.6 *5*	1.0 *3*	2362.6	(6)	1787.1	(6^-)	D[&]		R_{ADO}=1.15 *8*. A_2=+0.3 *1*.
577.1 *3*	4.9 *7*	2409.3	(11^-)	1832.2	10^+	D[@]		R_{ADO}=0.82 *2*. A_2=−0.25 *5*.
587.5 *5*	2.9 *5*	2374.4	$7^{(-)}$	1787.1	(6^-)	D[@]		R_{ADO}=0.80 *4*. A_2=−0.23 *8*.
601.9 *5*	0.9 *3*	2604.4	5	2002.5	$4^{(-)}$	D		R_{ADO}=0.89 *15*.

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^{208}Pb(^{18}O,^{14}Cγ) 2010As03,2010As01 (continued)

γ(^{212}Po) (continued)

E_γ [†]	I_γ [‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	Comments
612.3[#] *20*	2.7 *5*	1744.4	(4$^-$)	1132.01	4$^+$	(E1)	R_{ADO}=1.24 *27*. Mult.: E1 is suggested by 2010As03, as M1 or E2 multipolarities would lead to unexpectedly large transition strengths.
622.6 *5*	0.3 *1*	2374.4	7$^{(-)}$	1751.4	(8$^-$)	D	R_{ADO}=0.78 *10*.
633.2 *5*	0.9 *3*	2170.0		1536.8	3$^{(-)}$		R_{ADO}=0.82 *13*.
633.3[#] *20*	1.5 *3*	2465.5	10$^{(-)}$	1832.2	10$^+$	D	R_{ADO}=1.20 *16*. Mult.: Q or higher multipolarity would lead to unexpectedly large B($\sigma\lambda$) values.
633.6 *5*	0.9 *3*	2420.7		1787.1	(6$^-$)		
637.3 *5*	0.2 *1*	2469.7	(9$^-$)	1832.2	10$^+$		
661.3[#] *20*	5.1 *7*	2015.9	(6$^-$)	1354.62	6$^+$	(D)[&]	R_{ADO}=1.19 *9*. A_2=+0.26 *9*.
718.4 *5*	2.0 *5*	2469.7	(9$^-$)	1751.4	(8$^-$)	D[@]	R_{ADO}=0.76 *4*. A_2=−0.29 *5*.
727.1 *1*		727.10	2$^+$	0.0	0$^+$	E2[a]	R_{ADO}=1.14 *2*. A_2=+0.16 *4*.
740.2[#] *20*	0.7 *3*	3209.9		2469.7	(9$^-$)		
748.1 *5*	0.6 *3*	2102.9	5$^{(-)}$	1354.62	6$^+$		
757.2[#] *20*	0.8 *3*	2860.1		2102.9	5$^{(-)}$		
758.4 *5*	1.0 *3*	2295.2		1536.8	3$^{(-)}$		R_{ADO}=1.15 *11*.
774 *1*	0.2 *1*	2525.4		1751.4	(8$^-$)		
780.4[#] *20*	2.3 *5*	3154.8	7$^{(+)}$	2374.4	7$^{(-)}$	D	R_{ADO}=1.34 *9*. Mult.: Q or higher multipolarity would lead to unexpectedly large B($\sigma\lambda$) values.
809.7 *3*	7.6 *10*	1536.8	3$^{(-)}$	727.10	2$^+$	D	R_{ADO}=0.83 *6*.
813.6[#] *20*	3.4 *5*	1945.7	(4$^-$)	1132.01	4$^+$	(D)	R_{ADO}=1.13 *8*.
853.4 *5*	0.7 *2*	2604.5		1751.4	(8$^-$)		R_{ADO}=0.98 *20*.
860.3 *5*	0.5 *2*	2335.2	9	1475.1	8$^+$	D	R_{ADO}=0.74 *15*.
868.4 *5*	1.9 *4*	2700.5	(12$^+$)	1832.2	10$^+$	Q	R_{ADO}=1.18 *6*. A_2=+0.18 *6*.
873.1 *5*	1.4 *3*	2227.7	7	1354.62	6$^+$	D	R_{ADO}=0.84 *5*.
875.0 *5*	0.4 *2*	2877.5		2002.5	4$^{(-)}$		
899.0 *5*	0.4 *2*	2374.4	7$^{(-)}$	1475.1	8$^+$		
926.2 *5*	0.6 *3*	2280.7		1354.62	6$^+$	D	R_{ADO}=0.67 *14*.
953.1 *5*	0.8 *3*	2085.1		1132.01	4$^+$		R_{ADO}=1.1 *3*.
968.9 *5*	1.4 *3*	2100.9	5	1132.01	4$^+$	D	R_{ADO}=0.86 *10*.
971.1 *5*	2.6 *5*	2102.9	5$^{(-)}$	1132.01	4$^+$	D	R_{ADO}=0.79 *7*.
994.9 *5*	0.4 *2*	2469.7	(9$^-$)	1475.1	8$^+$		
1005[#] *1*	0.6 *3*	2837.2		1832.2	10$^+$		
1020 *1*	0.8 *2*	2374.4	7$^{(-)}$	1354.62	6$^+$	D[@]	R_{ADO}=0.76 *7*. A_2=−0.28 *8*.
1049[#] *2*	0.9 *3*	2881.2		1832.2	10$^+$		R_{ADO}=1.03 *17*.
1172.7 *5*	0.2 *1*	3004.9		1832.2	10$^+$		
1371[#] *2*	0.6 *3*	3203.2		1832.2	10$^+$		R_{ADO}=1.16 *20*.
1620[#] *2*	0.6 *3*	2974.6		1354.62	6$^+$		
1669[#] *2*	0.5 *2*	3023.6		1354.62	6$^+$		

[†] 2010As03 state that typical uncertainty is 0.1-0.5 keV, except for those transitions which show Doppler shift, where the

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^{208}Pb(^{18}O,^{14}Cγ) 2010As03,2010As01 (continued)

$\gamma(^{212}Po)$ (continued)

uncertainty can be up to 2 keV. The evaluators assign 0.1 keV for Iγ>10, 0.3 keV for Iγ=3-10, 0.5 keV for Iγ<3, 1 keV when Eγ stated to nearest keV, and 2 keV for Doppler-shifted lines.

‡ Normalized to 100 for Iγ(404.9)+Iγ(809.7).

The γ-ray exhibits Doppler shift.

@ ΔJ=1, dipole from $\gamma(\theta)$.

& ΔJ=0, dipole from $\gamma(\theta)$ (2010As03).

[a] Electric nature from polarization measurements, but polarization coefficients are not quoted in 2010As03.

[b] 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.

^{208}Pb(^{18}O,^{14}Cγ) 2010As03,2010As01

Level Scheme

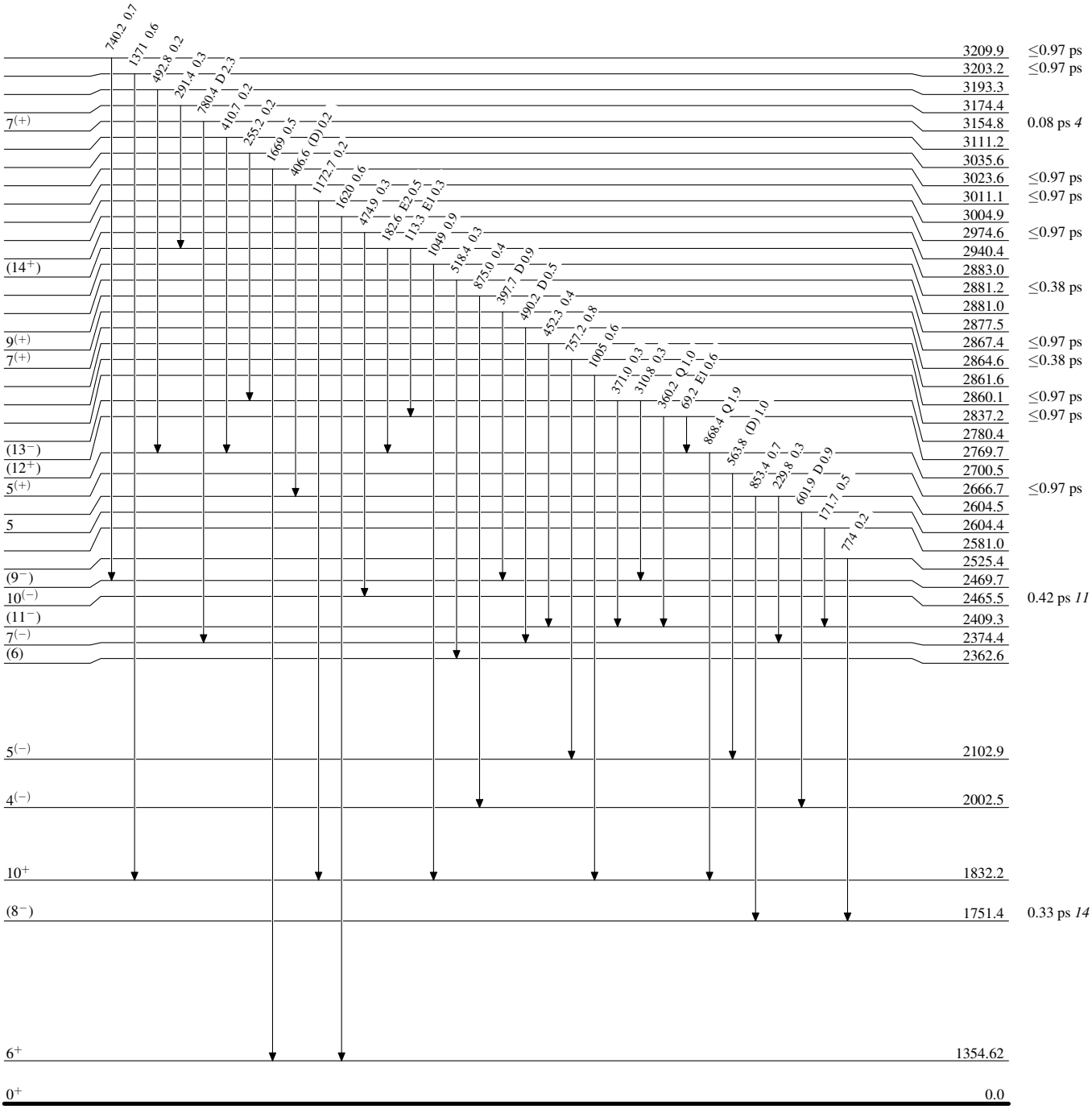
Intensities: Relative I_γ

Legend

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

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

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



$^{212}_{84}Po_{128}$

$^{208}Pb(^{18}O,^{14}C\gamma)$ 2010As03,2010As01

Level Scheme (continued)

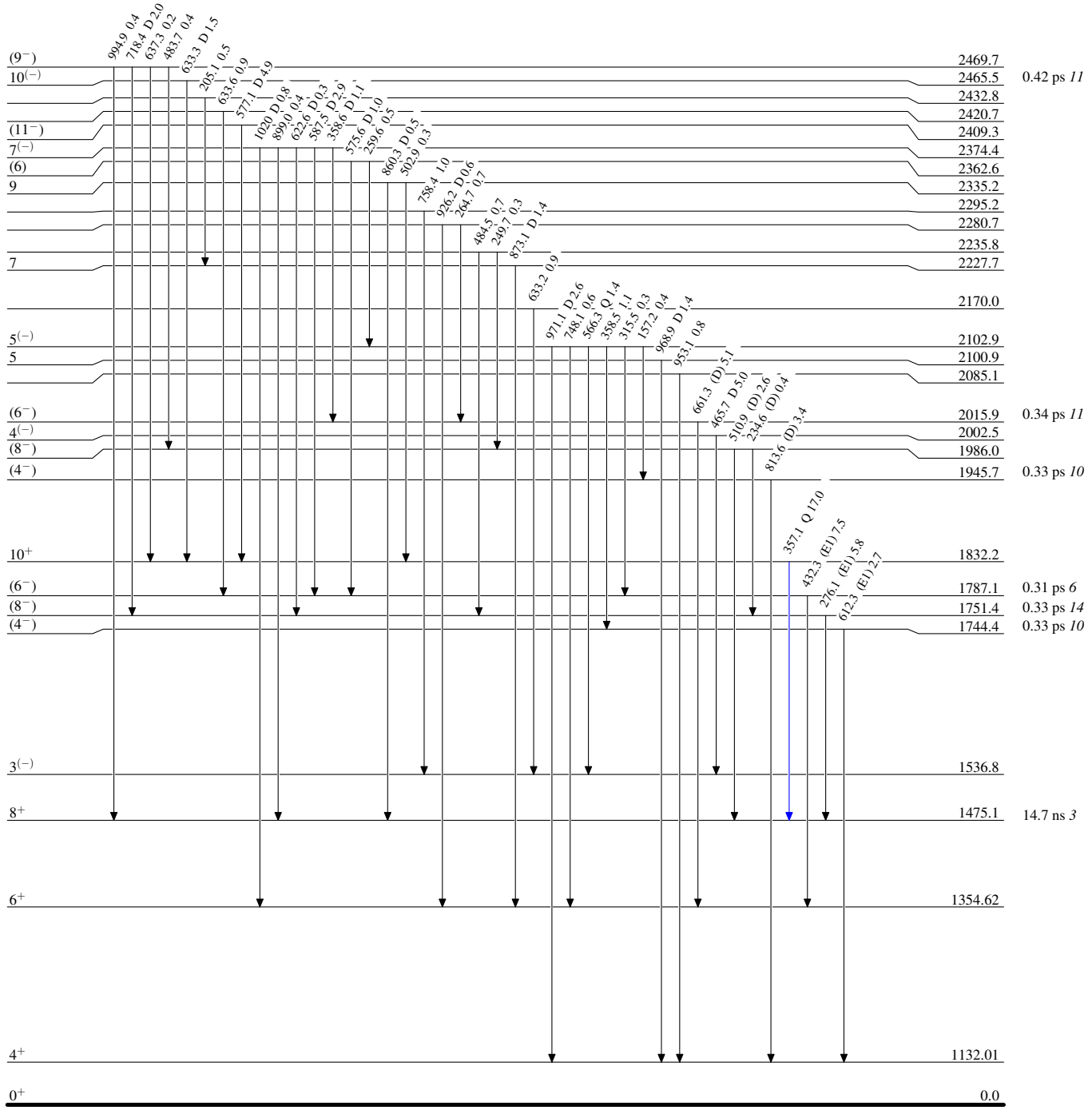
Intensities: Relative I_γ

Legend

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

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

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

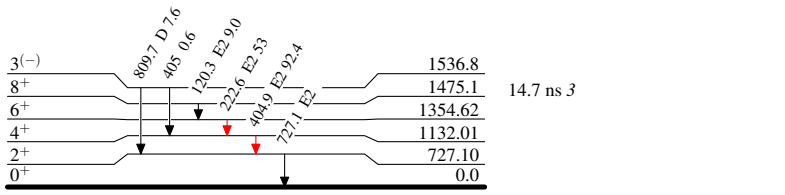


$^{212}_{84}Po_{128}$

^{208}Pb(^{18}O,^{14}Cγ) 2010As03,2010As01

Level Scheme (continued)

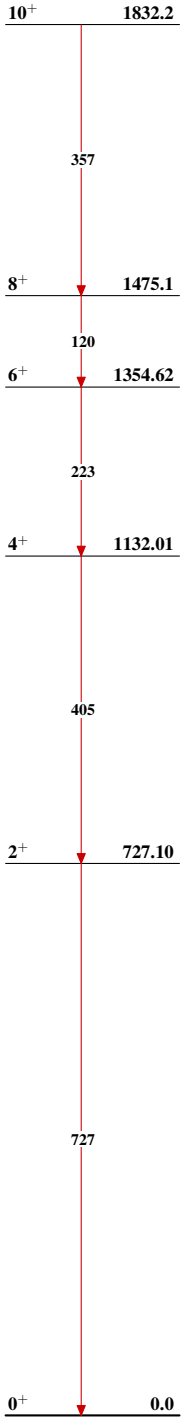
Intensities: Relative I_γ



$^{212}_{84}Po_{128}$

^{208}Pb(^{18}O,^{14}Cγ) 2010As03,2010As01

Seq.(A): Yrast sequence



$^{212}_{84}Po_{128}$