(HI,xnγ) 2009Mo05,2004Po06,2006Mo40

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	F. G. Kondev, S. Juutinen, D. J. Hartley	NDS 150, 1 (2018)	1-Feb-2018

2009Mo05: ^{186}W(^{7}Li,p4nγ) reaction with E=51-59 MeV provided by XTU tandem accelerator of the Laboratori Nazionali di Legnaro. Measured particle-γγ(t), Eγ, Iγ, angular correlations (DCO) using GASP array with 40 Compton-suppressed Ge detectors and 80-crystal BGO calorimeter. Charged particles were detected with ISIS ball of 40 ΔE-E telescopes.

2004Po06, 2006Mo40: deep inelastic reaction using ^{82}Se beam at 460 MeV on a ^{192}Os target, > 50 mg/cm^2 thick with a 0.2 mm Ta backing. GASP array in conjunction with a 80-crystal BGO calorimeter. Measured Eγ, Iγ, γγ coin.

The level scheme of 2009Mo05, which supersedes the earlier ones of 2004Po06 and 2006Mo40 (the same collaboration), is adopted by the evaluators.

^{188}Os Levels

E(level)[†]	Jπ[‡]	$T_{1/2}$	Comments
0.0[#]	0$^+$		
155.2[#] *4*	2$^+$		
478.3[#] *5*	4$^+$		
633.3 *4*	2$^+$		
790.2[@] *5*	3$^+$		
940.7[#] *6*	6$^+$		
966.0[&] *5*	4$^+$		
1181.7[@] *6*	5$^+$		
1279.6 *5*	4$^+$		
1414.7 *5*	3$^-$		
1425.4[&] *5*	6$^+$		
1515.4[#] *7*	8$^+$		
1516.0 *6*	5$^+$		
1669.2 *5*	5$^-$		configuration: ν(1/2$^-$[510],11/2$^+$[615]).
1685.4[@] *6*	7$^+$		
1771.5[b] *6*	7$^-$	14.00 ns *21*	$T_{1/2}$: From 390γ(t)+729γ(t) in 2009Mo05, by taking into account the decay of the 10$^-$ isomer.
1994.5[a] *7*	8$^-$		
1996.5[&] *8*	8$^+$		
2055.5 *7*	9$^-$		configuration: possible ν(7/2$^-$[503],11/2$^+$[615]).
2144.8[c] *8*	10$^-$	12.27 ns *14*	$T_{1/2}$: From 284γ(t) in 2009Mo05.
2170.7[#] *7*	10$^+$		
2243.0[b] *7*	9$^-$		
2279.5[@] *8*	9$^+$		
2459.0[d] *8*	11$^-$		
2500.9 *8*	(11$^-$)		
2522.8[a] *7*	10$^-$		
2558.6[e] *8*	10$^+$		
2655.6[&] *9*	10$^+$		
2734.1[c] *8*	12$^-$		
2813.7[f] *8*	11$^+$		
2816.9[b] *7*			
2856.8[#] *8*	12$^+$		
2869.4[g] *10*	(12$^-$)		
2933.5[@] *10*	11$^+$		
2981.4[e] *8*	12$^+$		

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(HI,xnγ) 2009Mo05,2004Po06,2006Mo40 (continued)

^{188}Os Levels (continued)

E(level)[†]	Jπ[‡]	Comments
3060.3[d] *9*	13⁻	
3083.9 *7*		
3093.6 *8*	13⁻	configuration: possible ν(1/2⁻[510],7/2⁻[503],9/2⁻[505],11/2⁺[615]).
3144.0[a] *9*	(12⁻)	
3205.6[b] *9*		
3255.8[f] *8*	13⁺	
3290.1[g] *11*		
3353.1[c] *9*	14⁻	
3370.0[&] *10*	12⁺	
3414.1 *9*	15⁻	configuration: possible ν(3/2⁻[512],7/2⁻[503],9/2⁻[505],11/2⁺[615]) or ν(1/2⁻[510],11/2⁺[615])⊗π(9/2⁻[514],11/2⁻[505]).
3417.6 *9*		
3439.3[e] *8*	14⁺	
3441.6 *10*		
3472.3 *8*	14⁺	configuration: possible ν(1/2⁻[510],9/2⁻[505],9/2⁺[624],11/2⁺[615]).
3563.1[#] *9*	14⁺	
3601.5[@] *11*	13⁺	
3621.1[b] *6*		
3640.7 *9*		
3722.6[g] *12*		
3731.1[d] *10*	15⁻	
3734.5 *9*	16⁺	
3767.2 *9*		
3796.0[f] *9*	(15⁺)	
3825.7[a] *10*	(14⁻)	
3826.9 *10*		
3911.5 *10*		
3965.1[e] *10*	16⁺	
4107.4[c] *10*	16⁻	
4149.8 *10*	17	
4185.3[g] *13*		
4193.6 *11*		
4237.0[#] *11*	(16⁺)	
4258.3[h] *10*	18⁺	
4286.1 *10*		
4391.0 *9*	(17)	
4414.0[f] *12*	(17⁺)	
4428.9 *10*		
4484.7[d] *11*	17⁻	
4509.2 *10*	(17)	
4521.1[a] *12*	(16⁻)	
4563.9 *12*		
4572.4[e] *11*	18⁺	
4649.9 *10*		
4729.9[h] *11*	19	
4847.2[c] *12*	(18⁻)	
4887.5 *11*		
5033.7 *9*	(19⁻)	
5125.3[h] *12*	21	
5177.7[d] *12*	(19⁻)	
5268.1[e] *12*	(20⁺)	

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(HI,xnγ) 2009Mo05,2004Po06,2006Mo40 (continued)

^{188}Os Levels (continued)

E(level)[†]	Jπ[‡]
5620.6[h] *13*	
6032.5[e] *13*	(22$^+$)
6118.1[h] *14*	
6607.6[h] *15*	
6911.1[e] *9*	(24$^+$)

[†] From a least-squares fit to Eγ's, by assuming ΔEγ=0.5 keV.
[‡] From 2009Mo05, based on the deduced transition multipolarities, the observed apparent band structures and systematics in the region.
[#] Band(A): $K^\pi=0^+$ g.s. band.
[@] Band(B): γ band, α=1.
[&] Band(b): γ band, α=0.
[a] Band(C): $K^\pi=7^-$ band, α=0, configuration=ν(3/2$^-$[512],11/2$^+$[615]).
[b] Band(c): $K^\pi=7^-$ band, α=1, configuration=ν(3/2$^-$[512],11/2$^+$[615]).
[c] Band(D): $K^\pi=10^-$ band, α=0, configuration=ν(9/2$^-$[505],11/2$^+$[615]).
[d] Band(d): $K^\pi=10^-$ band, α=1, configuration=ν(9/2$^-$[505],11/2$^+$[615]).
[e] Band(E): $K^\pi=10^+$ band, α=0, configuration=ν(9/2$^+$[624],11/2$^+$[615]).
[f] Band(e): $K^\pi=10^+$ band, α=1, configuration=ν(9/2$^+$[624],11/2$^+$[615]).
[g] Band(F): Band based on (12$^-$) level at 2869 keV.
[h] Band(G): Band based on 18$^+$ level at 4258 keV.

γ(^{188}Os)

Eγ[†]	Iγ[†]	Ei(level)	Jiπ	Ef	Jfπ	Mult.[‡]	Comments
89.2	7.4 *4*	2144.8	10$^-$	2055.5	9$^-$	(M1)	Mult.: α(exp)=13 *1*, from the intensity balance, but it exceeds that expected for Mult.=M1 and E2.
102.4	25.2 *6*	1771.5	7$^-$	1669.2	5$^-$		
155.2	100.0 *20*	155.2	2$^+$	0.0	0$^+$	E2	DCO=0.83 *9*
223.0	26.4 *7*	1994.5	8$^-$	1771.5	7$^-$	M1	DCO=0.41 *5*
236.4	1.4 *1*	1516.0	5$^+$	1279.6	4$^+$		
243.8	6.7 *2*	1669.2	5$^-$	1425.4	6$^+$	(E1)	DCO=2 *1*, but value is ambiguous given the proposed assignment in 2009Mo05.
248.5	5.8 *1*	2243.0	9$^-$	1994.5	8$^-$		
254.5	19.8 *8*	1669.2	5$^-$	1414.7	3$^-$		DCO=0.5 *1*
254.9		2813.7	11$^+$	2558.6	10$^+$	(M1)	DCO=0.9 *2*
262.3	18.3 *5*	3734.5	16$^+$	3472.3	14$^+$	E2	DCO=1.00 *12*
267.0	4.9 *2*	3083.9		2816.9			
270.2	1.7 *1*	3083.9		2813.7	11$^+$		
274.4	8.6 *2*	3255.8	13$^+$	2981.4	12$^+$	M1	DCO=0.5 *2*
275.1	1.6 *1*	2734.1	12$^-$	2459.0	11$^-$		
279.8	1.1 *2*	2522.8	10$^-$	2243.0	9$^-$		
284.1	76.2 *17*	2055.5	9$^-$	1771.5	7$^-$	E2	DCO=0.85 *6*
292.8	0.3 *1*	3353.1	14$^-$	3060.3	13$^-$		
294.1	0.6 *1*	2816.9		2522.8	10$^-$		
314.2	43.7 *12*	2459.0	11$^-$	2144.8	10$^-$	M1	DCO=0.28 *2*
316.0	9.3 *6*	2816.9		2500.9	(11$^-$)	D	DCO=0.25 *4*
320.4	19.9 *7*	3734.5	16$^+$	3414.1	15$^-$		
320.5		3414.1	15$^-$	3093.6	13$^-$	E2	DCO=0.94 *9*

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(HI,xnγ) 2009Mo05,2004Po06,2006Mo40 (continued)

γ(^{188}Os) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	Comments
323.1	134 *3*	478.3	4^+	155.2	2^+	E2	DCO=0.97 *7*
326.2	4.9 *1*	3060.3	13^-	2734.1	12^-		
332.7	9.1 *3*	966.0	4^+	633.3	2^+	E2	DCO=1.4 *3*
333.7	1.0 *1*	3417.6		3083.9			
353.8	6.8 *2*	3414.1	15^-	3060.3	13^-	E2	DCO=0.9 *2*
354.6		3826.9		3472.3	14^+		
356.1	8.7 *2*	2500.9	(11^-)	2144.8	10^-	M1	DCO=0.40 *6*
356.8		3796.0	(15^+)	3439.3	14^+		
359.5	7.9 *2*	3093.6	13^-	2734.1	12^-	M1	DCO=0.29 *6*
366.7	2.3 *1*	4193.6		3826.9			
378.6	11.4 *3*	3472.3	14^+	3093.6	13^-	E1	DCO=0.62 *5*
383.8		5033.7	(19^-)	4649.9			
388.7		3205.6		2816.9			
389.6	53.2 *15*	1669.2	5^-	1279.6	4^+	(E1)	DCO=0.51 *8*
391.4	14.0 *6*	1181.7	5^+	790.2	3^+	E2	DCO=1.25 *15*
391.6		4649.9		4258.3	18^+		
395.4	3.6 *3*	5125.3	21	4729.9	19	E2	DCO=0.86 *13*
410.4	8.8 *2*	2869.4	(12^-)	2459.0	11^-	M1	DCO=0.34 *9*
414.1		4563.9		4149.8	17		
415.3	7.7 *2*	4149.8	17	3734.5	16^+	D	DCO=0.21 *3*
415.5[#]		3621.1		3205.6			
420.7	2.7 *1*	3290.1		2869.4	(12^-)		
423.1	3.0 *2*	2981.4	12^+	2558.6	10^+		
432.5	0.5 *1*	3722.6		3290.1			
442.0	4.4 *1*	3255.8	13^+	2813.7	11^+		
448.7	5.5 *4*	1414.7	3^-	966.0	4^+		
458.0		3439.3	14^+	2981.4	12^+		
459.4	11.5 *5*	1425.4	6^+	966.0	4^+		DCO=0.47 *15*
462.4	86.0 *20*	940.7	6^+	478.3	4^+	E2	DCO=0.99 *5*
462.7		4185.3		3722.6			
471.5	5.1 *2*	2243.0	9^-	1771.5	7^-		
471.6		4729.9	19	4258.3	18^+	D	DCO=0.34 *7*
478.1	17.2 *5*	633.3	2^+	155.2	2^+	M1(+E2)	DCO=0.8 *2*
479.5	4.5 *2*	4391.0	(17)	3911.5		D	DCO=0.26 *8*
484.7	3.7 *1*	1425.4	6^+	940.7	6^+		
487.6	42.9 *9*	1669.2	5^-	1181.7	5^+		
487.7		966.0	4^+	478.3	4^+	M1(+E2)	DCO=0.63 *12*
489.4	15.1 *4*	1279.6	4^+	790.2	3^+		
489.5		6607.6		6118.1		(E2)	DCO=1.06 *15*
495.3	1.9 *1*	5620.6		5125.3	21		
497.4	2.9 *2*	3911.5		3414.1	15^-		
497.5		6118.1		5620.6			
503.2	17.7 *6*	2558.6	10^+	2055.5	9^-	E1	DCO=0.60 *11*
503.5		1685.4	7^+	1181.7	5^+		
523.8	13.6 *3*	4258.3	18^+	3734.5	16^+	E2	DCO=0.96 *12*
524.5		5033.7	(19^-)	4509.2	(17)	E2	DCO=0.99 *15*
525.8	4.8 *2*	3965.1	16^+	3439.3	14^+	E2	DCO=1.0 *3*
528.3	4.0 *1*	2522.8	10^-	1994.5	8^-		
540.2	1.8 *1*	3796.0	(15^+)	3255.8	13^+		
550.0	1.6 *1*	1516.0	5^+	966.0	4^+		
571.1	7.0 *4*	1996.5	8^+	1425.4	6^+	E2	DCO=0.9 *2*
573.9		2816.9		2243.0	9^-	D,E2	DCO=0.7 *2*
574.7	55.8 *14*	1515.4	8^+	940.7	6^+	E2	DCO=1.16 *7*
582.4	4.6 *3*	3439.3	14^+	2856.8	12^+	E2	DCO=1.21 *6*
583.0	7.7 *4*	3083.9		2500.9	(11^-)	D,E2	DCO=1.3 *3*
589.3	17.5 *4*	2734.1	12^-	2144.8	10^-	E2	DCO=1.02 *9*

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(HI,xnγ) 2009Mo05,2004Po06,2006Mo40 (continued)

γ(^{188}Os) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	Comments
594.1		2279.5	9^+	1685.4	7^+	E2	DCO=1.06 *2*
601.3	9.5 *3*	3060.3	13^-	2459.0	11^-	E2	DCO=0.9 *1*
607.3		4572.4	18^+	3965.1	16^+	(E2)	DCO=0.6 *2*, but value is ambiguous given the proposed assignment in 2009Mo05.
615.5	18.2 *4*	3472.3	14^+	2856.8	12^+	E2	DCO=1.05 *9*
618[#]		4414.0	(17^+)	3796.0	(15^+)		E_γ: γ shown in level-scheme figure only.
619.0	5.3 *3*	3353.1	14^-	2734.1	12^-	E2	DCO=1.1 *3*
621.2	2.5 *2*	3144.0	(12^-)	2522.8	10^-		
624.5	9.3 *3*	1414.7	3^-	790.2	3^+		
629.2	1.8 *3*	4887.5		4258.3	18^+	D,E2	DCO=1.2 *3*
633.3	26.2 *9*	633.3	2^+	0.0	0^+	E2	DCO=0.9 *3*
634.6	65.3 *18*	3093.6	13^-	2459.0	11^-	E2	DCO=0.81 *14*
635.0		790.2	3^+	155.2	2^+		
642.7	3.3 *2*	5033.7	(19^-)	4391.0	(17)	E2	DCO=0.9 *3*
646.3	33.9 *8*	1279.6	4^+	633.3	2^+	(E2)	DCO=0.74 *15*, but value is ambiguous given the proposed assignment in 2009Mo05.
654.0	3.3 *2*	2933.5	11^+	2279.5	9^+	E2	DCO=1.0 *4*
655.3	43.1 *12*	2170.7	10^+	1515.4	8^+	E2	DCO=1.03 *8*
659.1	3.6 *2*	2655.6	10^+	1996.5	8^+	E2	DCO=1.4 *7*
668.0	2.0 *1*	3601.5	13^+	2933.5	11^+	E2	DCO=1.0 *5*
670.8	5.0 *2*	3731.1	15^-	3060.3	13^-	(E2)	DCO=1.6 *4*
673.9	1.6 *1*	4237.0	(16^+)	3563.1	14^+		
681.7	0.9 *2*	3825.7	(14^-)	3144.0	(12^-)		
686.1	32.5 *7*	2856.8	12^+	2170.7	10^+	E2	DCO=1.01 *7*
693.0	3.6 *4*	5177.7	(19^-)	4484.7	17^-		
694.4	3.3 *3*	4428.9		3734.5	16^+	D,E2	DCO=1.1 *2*
695.4	1.2 *3*	4521.1	(16^-)	3825.7	(14^-)		
695.7		5268.1	(20^+)	4572.4	18^+		
703.2	36.5 *9*	1669.2	5^-	966.0	4^+	(E1)	DCO=0.48 *14*
703.3		1181.7	5^+	478.3	4^+	M1	DCO=0.78 *14*
706.3	5.3 *3*	3563.1	14^+	2856.8	12^+		
707.5	1.8 *2*	3441.6		2734.1	12^-	E2	DCO=1.1 *2*
714.4	0.6 *2*	3370.0	12^+	2655.6	10^+	E2	DCO=1.2 *4*
725.8	2.8 *1*	1516.0	5^+	790.2	3^+	E2	DCO=0.9 *2*
728.5	23.6 *5*	1669.2	5^-	940.7	6^+	(E1)	DCO=0.8 *2*
739.8	2.1 *1*	4847.2	(18^-)	4107.4	16^-		
745.0	1.5 *2*	1685.4	7^+	940.7	6^+		
753.6	1.6 *1*	4484.7	17^-	3731.1	15^-		
754.3		4107.4	16^-	3353.1	14^-	(E2)	DCO=0.8 *2*, but value is ambiguous given the proposed assignment in 2009Mo05.
764.4	0.9 *1*	6032.5	(22^+)	5268.1	(20^+)		
775.4	1.5 *1*	5033.7	(19^-)	4258.3	18^+	(E1)	DCO=0.85 *15*
783.9	1.9 *1*	3640.7		2856.8	12^+	D,E2	DCO=0.8 *2*
810.7	14.5 *3*	2981.4	12^+	2170.7	10^+		
810.8		966.0	4^+	155.2	2^+	E2	DCO=1.3 *3*
830.7	2.9 *3*	1771.5	7^-	940.7	6^+		
878.6[#]		6911.1	(24^+)	6032.5	(22^+)		
910.4	0.9 *1*	3767.2		2856.8	12^+		
913.3	2.6 *1*	3083.9		2170.7	10^+		
933.0	0.9 *1*	4286.1		3353.1	14^-		
936.4	2.0 *1*	1414.7	3^-	478.3	4^+		
947.1	1.2 *1*	1425.4	6^+	478.3	4^+		
976.9	1.3 *1*	4391.0	(17)	3414.1	15^-	E2	DCO=1.0 *4*
1095.1	3.6 *2*	4509.2	(17)	3414.1	15^-	(E2)	DCO=1.1 *2*
1190.9	5.0 *2*	1669.2	5^-	478.3	4^+		

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(HI,xnγ) 2009Mo05,2004Po06,2006Mo40 (continued)

$\gamma(^{188}Os)$ (continued)

† From 2009Mo05.
‡ From DCO ratios in 2009Mo05 and the observed apparent band structures. DCO′s are for 35° (also 145°) and 72° (also 108°) geometry and gates on stretched quadrupole transitions. Expected ratio is ≈1 for stretched quadrupole (ΔJ=2) and ≈0.6 for stretched dipole (ΔJ=1). In some cases, the uncertainties in the DCO ratios are too big in order to make unambiguous assignment and in such cases multipolarities are inferred from the level spin differences.
# Placement of transition in the level scheme is uncertain.

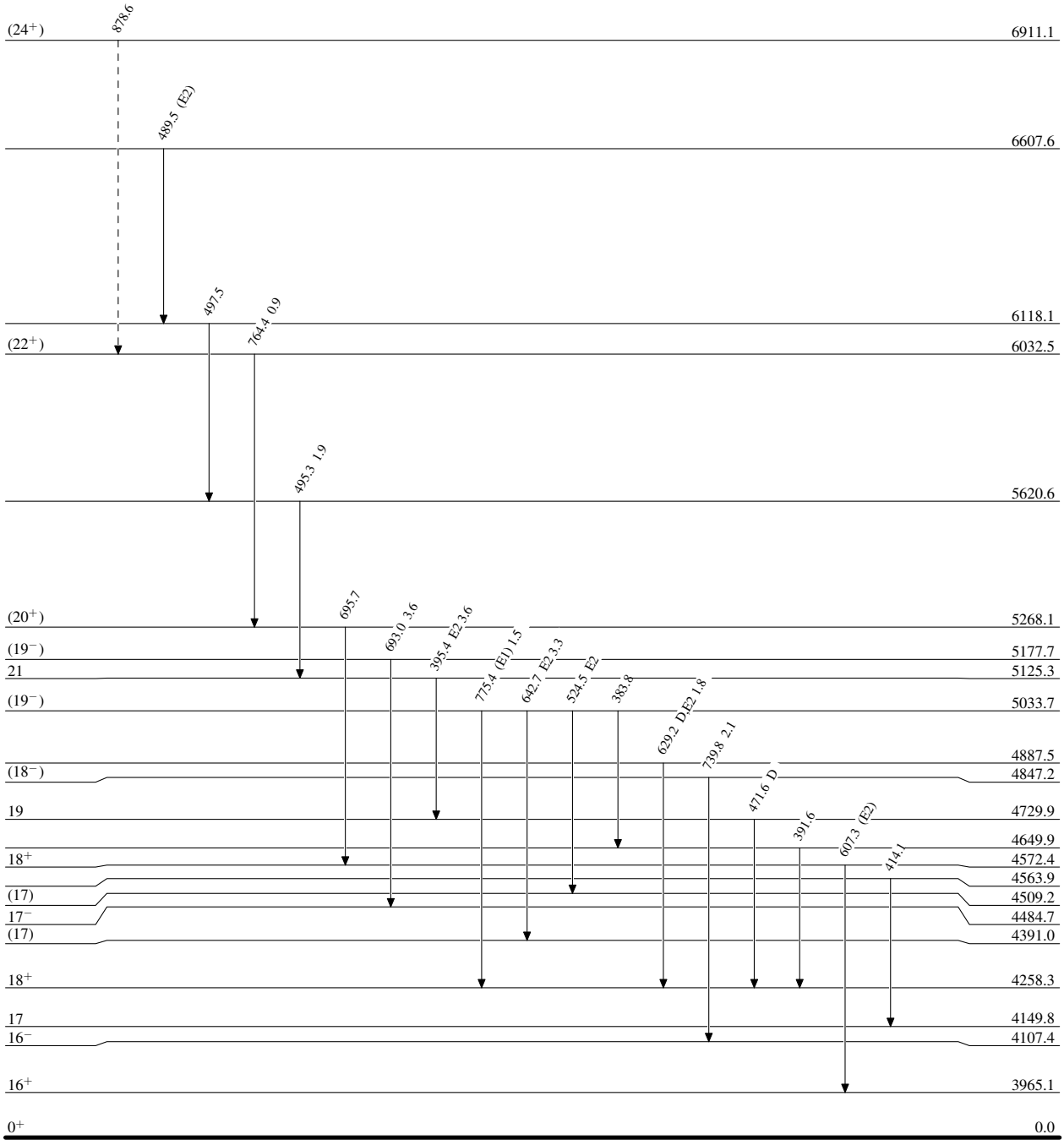
(HI,xnγ) 2009Mo05,2004Po06,2006Mo40

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)



$^{188}_{76}Os_{112}$

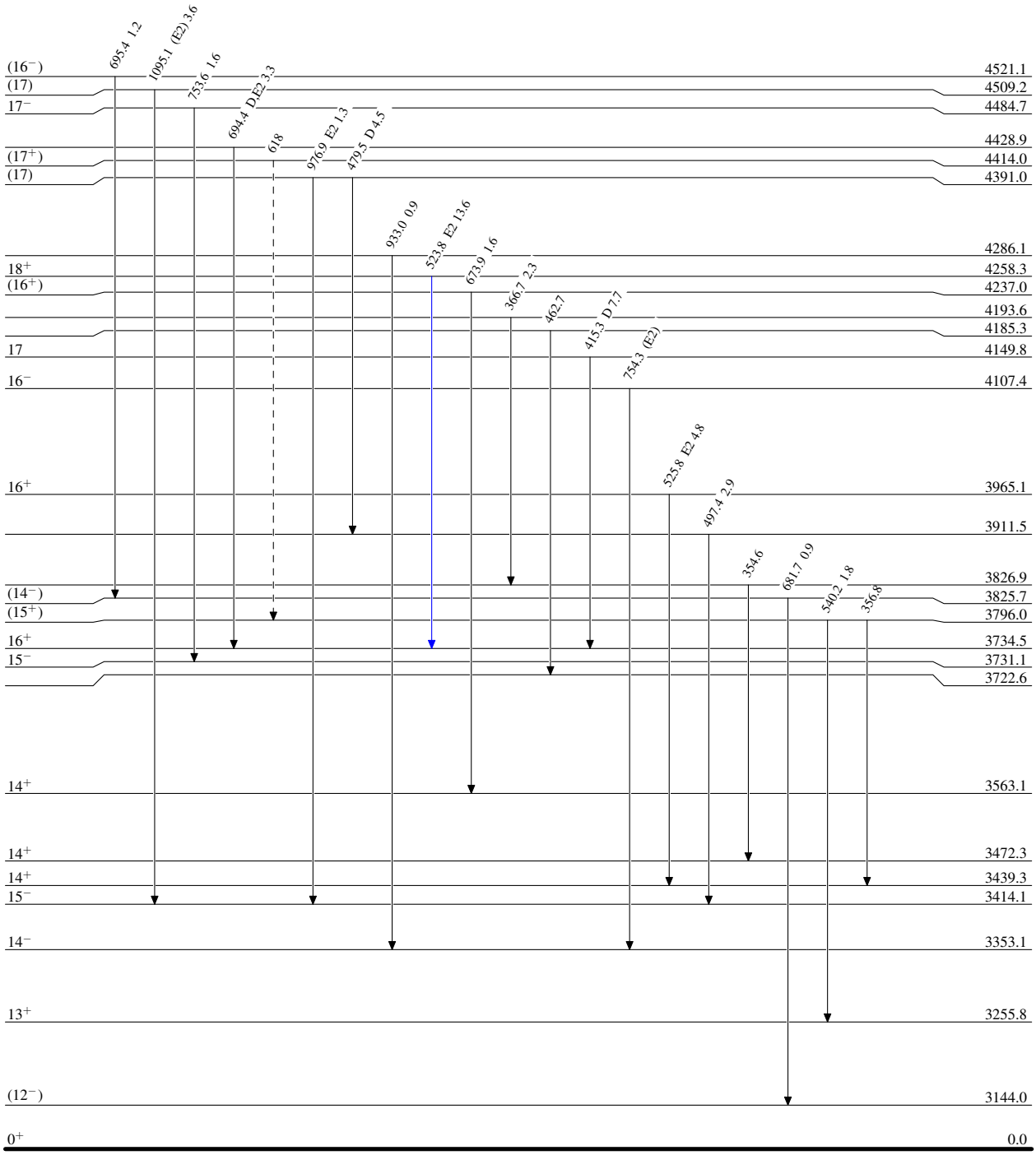
(HI,xnγ) 2009Mo05,2004Po06,2006Mo40

Level Scheme (continued)

Intensities: Relative I_γ

Legend

$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$
γ Decay (Uncertain)



$^{188}_{76}Os_{112}$

(HI,xnγ) 2009Mo05,2004Po06,2006Mo40

Level Scheme (continued)

Intensities: Relative I_γ

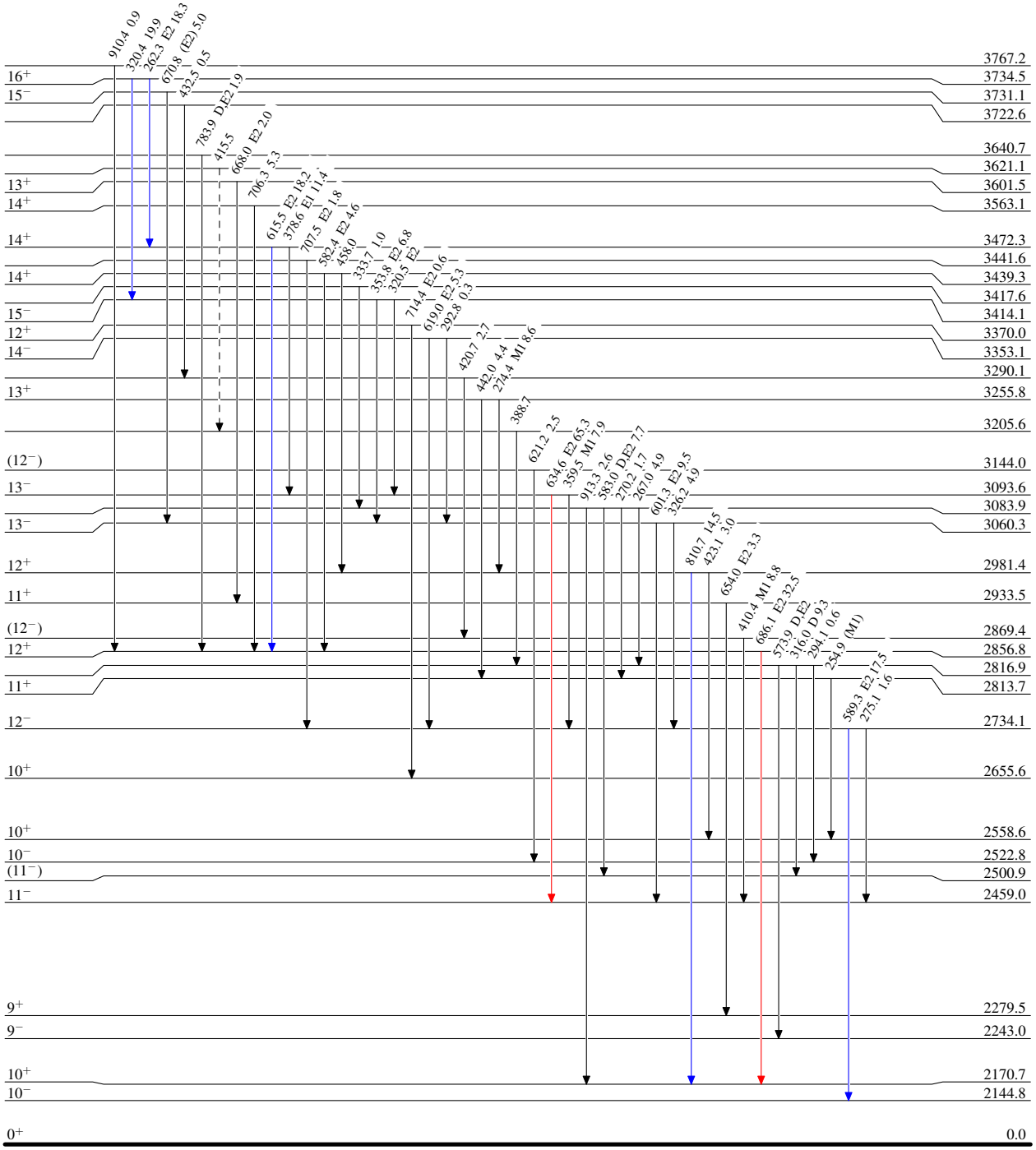
Legend

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

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

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

γ Decay (Uncertain)



$^{188}_{76}Os_{112}$

(HI,xnγ) 2009Mo05,2004Po06,2006Mo40

Level Scheme (continued)

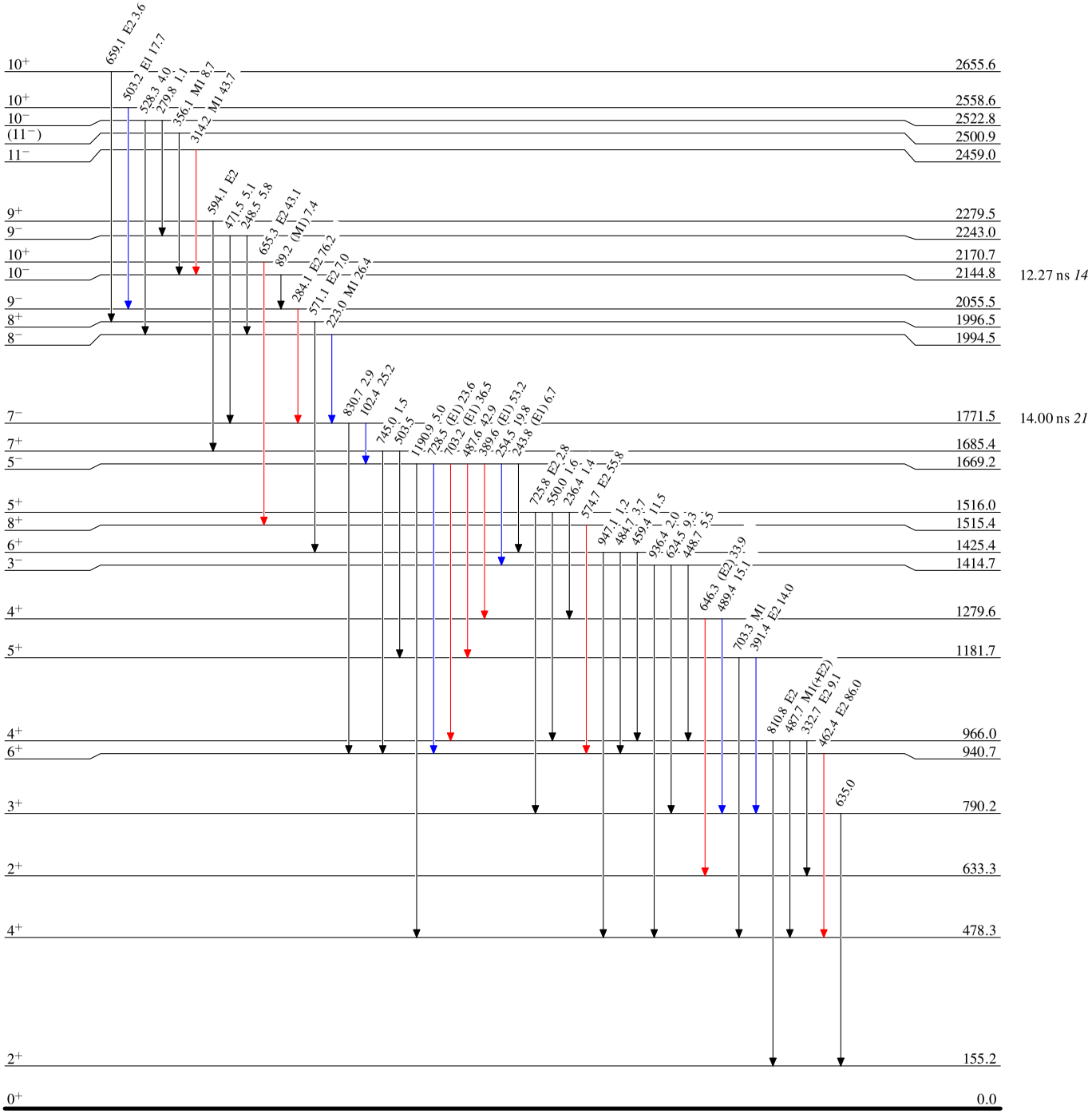
Intensities: Relative I_γ

Legend

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

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

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

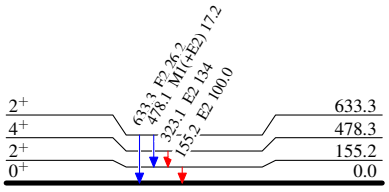


$^{188}_{76}Os_{112}$

(HI,xnγ) 2009Mo05,2004Po06,2006Mo40

Level Scheme (continued)

Intensities: Relative I_γ



$^{188}_{76}Os_{112}$

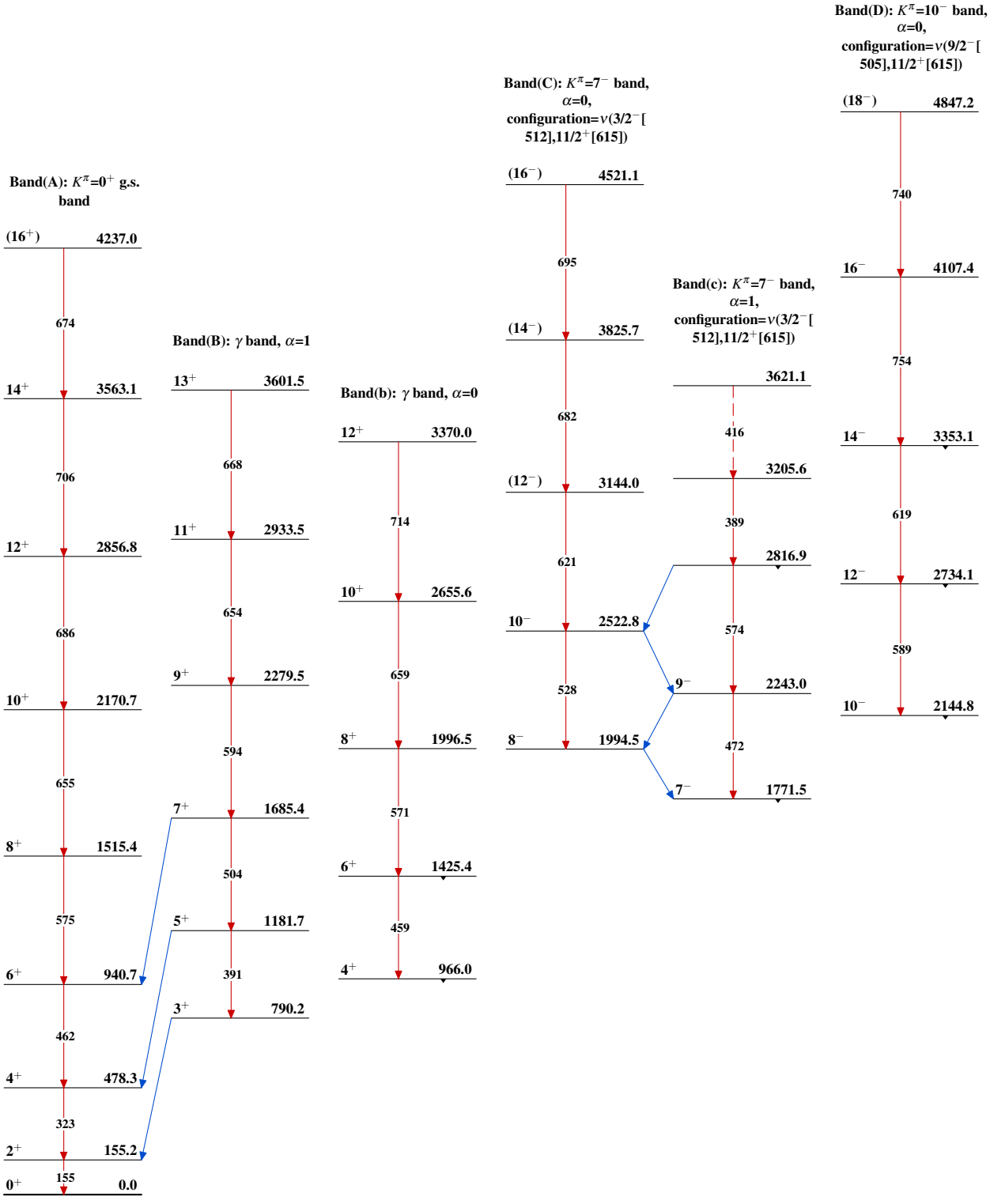
Legend

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

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

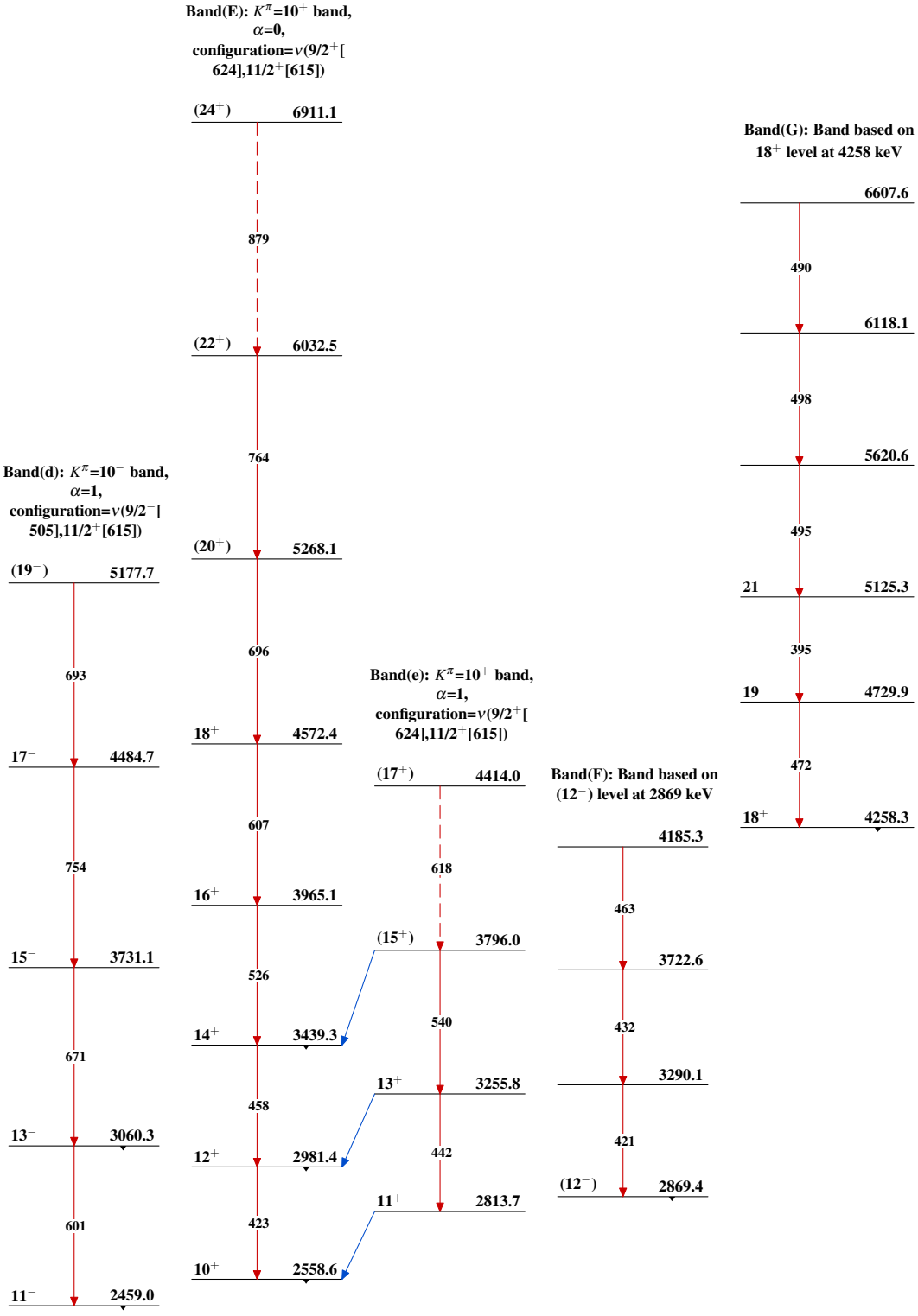
$I_\gamma > 10\% \times I_\gamma^{max}$

(HI,xnγ) 2009Mo05,2004Po06,2006Mo40



$^{188}_{76}Os_{112}$

(HI,xnγ) 2009Mo05,2004Po06,2006Mo40 (continued)



$^{188}_{76}Os_{112}$