Adopted Levels, Gammas

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

Q(β^-)=349 *3*; S(n)=6835 *3*; S(p)=9061 *56*; Q(α)=407 *40* 2017Wa10
Additional information 1.

^{188}W Levels

Cross Reference (XREF) Flags

A	^{188}Ta β^- decay	D	^{192}Os(^{82}Se,Xγ)
B	^{186}W(t,p)	E	^{186}W(^{136}Xe,Xγ)
C	^{186}W(^{18}O,^{16}Oγ)	F	^{186}W(^{7}Li,αpγ)

E(level)†	J$^\pi$	T$_{1/2}$	XREF	Comments
0#	0$^+$	69.78 d *12*	ABCDEF	%β^-=100 T$_{1/2}$: From 2014Un01, supersedes previously reported 69.77 d *5* (2012Fi12) and 69.78 d *5* (2002Zi01,2002Un02) by the same group. Others: 69.5 d *7* (2002Po17), 69.4 d *5* (1962Ro16) and 65 d *5* (1951Li07).
143.16# *8*	2$^+$	0.87 ns *12*	ABCDEF	J$^\pi$: 142.9γ E2 to 0$^+$. T$_{1/2}$: From 143γ-250γ-750γ(t) in LaBr$_3$:Ce detectors, using a $\gamma\gamma$(t) gated by the 296γ, 432γ and 485γ in the HPGe detectors (2013Ma66) in ^{186}W(^{7}Li,αpγ).
439.49# *13*	4$^+$		ABCDEF	XREF: B(442). J$^\pi$: 296.2γ E2 to 2$^+$; band assignment.
628.14@ *8*	2$^+$		BC F	XREF: B(630). J$^\pi$: 628.4γ (E2) to 0$^+$; 484.7γ (M1+E2) to 2$^+$; systematics of K^π=2$^+$ γ-vibrational bands in neighboring nuclei; band assignment.
780‡ *2*			B	
854.13 *21*	(0$^+$,2,4$^+$)		C F	J$^\pi$: 711γ D (ΔJ=0) or E2 to 2$^+$; non observation of a γ-ray transition to 0$^+$.
871.10# *16*	6$^+$		A CDEF	J$^\pi$: 431.6γ E2 to 4$^+$; band assignment.
886‡ *10*	(0$^+$)		B	J$^\pi$: L(t,p)=(0).
939.23@ *21*	4$^+$		C	J$^\pi$: 796.5γ E2 to 2$^+$, 499.7γ to 4$^+$; band assignment.
979.37& *13*	2$^{(-)}$		C EF	J$^\pi$: 351.2γ (E1), ΔJ=0 to 2$^+$; systematics of octupole bands in neighboring nuclei; absence of γ ray to 0$^+$ would argue against J=1; band assignment.
1070.7& *4*	3$^{(-)}$		BC E	XREF: B(1073). J$^\pi$: 928.0γ (E1) to 2$^+$, 91γ to 2$^{(-)}$, 630.2γ to 4$^+$; band assignment.
1193.77& *16*	4$^{(-)}$		C E	J$^\pi$: 214.4γ E2 to 2$^{(-)}$; band assignment.
1228.9 *5*	2$^+$,3,4$^+$		BC	XREF: B(1233). J$^\pi$: 600.6γ to 2$^+$, 788.8γ to 4$^+$.
1341.7& *5*	5$^{(-)}$		A C E	J$^\pi$: 903γ (E1) to 4$^+$, 271.6γ to 3$^{(-)}$, 469.4γ to 6$^+$; band assignment.
1425.15# *25*	8$^+$		C E	J$^\pi$: 554.0γ E2 to 6$^+$; band assignment.
1437‡ *5*			B	
1473‡ *10*			B	
1533.77& *19*	6$^{(-)}$		C E	J$^\pi$: 340.0γ (E2) to 4$^{(-)}$; band assignment.
1538.2 *4*	(5$^+$)		C	J$^\pi$: 344.3γ to 4$^{(-)}$, 1099.0γ to 4$^+$ and 667.5γ to 6$^+$. The absence of transitions to 2$^+$ and 3$^-$ levels would argue against J=4 and 5$^-$. configuration: ν1/2[510]$\otimes\nu$9/2[505] (K^π=5$^+$) proposed in 2006Sh23. The assignment is tentative.
1544‡ *5*			B	
1721‡ *5*			B	

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Adopted Levels, Gammas (continued)

^{188}W Levels (continued)

E(level)[†]	Jπ	T1/2	XREF	Comments
1728.7[&] 5	7(−)		E	Jπ: 387γ to 5(−) and 303γ to 8+; band assignment.
1742.7 5	7(−)		A E	Jπ: 401γ to 5(−) and 317γ to 8+ allow for Jπ=6+ or 7−. An apparent mixing with the 7(−) level at 1729.8 keV is consistent with 7(−) for this level (2010La16). configuration: ν3/2[512]⊗ν11/2[615] (Kπ=7−) proposed in 2010La16. The assignment is tentative.
1816[‡] 10			B	E(level): possible doublet.
1897[‡] 5			B	
1915[‡] 5			B	
1926.7[a] 8	8−	109.5 ns 35	A E	Jπ: 184γ M1 to 7(−); systematics of similar isomers in neighboring nuclei. T1/2: From sum of 144, 297 and 432γ(t) in 2010La16. configuration: π7/2[404]⊗π9/2[514] (Kπ=8−) proposed in 2010La16. The assignment is supported by the measured gK-gR=0.76 4, where Q0=6.5 eb, which is in good agreement with the expected value of 0.70 from the Nilsson model and by assuming gR=0.3.
1960[‡] 10	(0+)		B	Jπ: L(t,p)=(0).
1994[‡] 10			B	
2028[‡] 5			B	
2104[‡] 5			B	
2175[‡] 5			B	
2264[‡] 5			B	
2274.4[a] 12	(9−)		E	Jπ: 348γ to 8−; band assignment.
2314[‡] 5			B	
2394[‡] 5			B	
2427[‡] 10			B	E(level): possible doublet.
2665.9[a] 12	(10−)		E	Jπ: 392γ to (9−), 739γ to 8−; band assignment.
3086.7[a] 13	(11−)		E	Jπ: 421γ to (10−), 812γ to (9−); band assignment.

[†] From a least-squares fit to Eγ's, unless otherwise stated.
[‡] From ^{186}W(t,p).
[#] Band(A): Kπ=0+, g.s. band.
[@] Band(B): Kπ=2+, γ-vibrational band.
[&] Band(C): Kπ=2−, octupole band.
[a] Band(D): Kπ=8−, π7/2[404]⊗π9/2[514] band.

γ(^{188}W)

Ei(level)	Jiπ	Eγ[†]	Iγ[†]	Ef	Jfπ	Mult.[†]	α[#]	Comments
143.16	2+	142.9 1	100	0	0+	E2	1.001	α(K)=0.406 6; α(L)=0.451 7; α(M)=0.1134 17 α(N)=0.0268 4; α(O)=0.00371 6; α(P)=3.05×10−5 5 B(E2)(W.u.)=85 12 Mult.: R(asym)=1.13 3 (2006Sh23).
439.49	4+	296.3 1	100	143.16	2+	E2	0.0882	α(K)=0.0589 9; α(L)=0.0224 4; α(M)=0.00546 8 α(N)=0.001297 19; α(O)=0.000188 3; α(P)=5.04×10−6 7 Mult.: R(asym)=1.67 3 (2006Sh23).
628.14	2+	484.7 1	84 12	143.16	2+	(M1+E2)	0.042 20	α(K)=0.034 17; α(L)=0.0060 19; α(M)=0.0014 4 α(N)=0.00033 10; α(O)=5.3×10−5 18; α(P)=3.3×10−6

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Adopted Levels, Gammas (continued)

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

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[†]	α[#]	Comments
								18 Mult.: R(asym)=0.70 *3* (2006Sh23).
628.14	2^+	628.4 *1*	100 *28*	0	0^+	(E2)	0.01216	α(K)=0.00960 *14*; α(L)=0.00197 *3*; α(M)=0.000461 *7* α(N)=0.0001101 *16*; α(O)=1.707×10^{-5} *24*; α(P)=8.87×10^{-7} *13* Mult.: R(asym)=1.00 *5* (2006Sh23).
854.13	$(0^+,2,4^+)$	711.0 *2*	100	143.16	2^+	D,E2		Mult.: R(asym)=1.00 *4* (2006Sh23), suggests D (ΔJ=0) or E2 transition.
871.10	6^+	431.6 *1*	100	439.49	4^+	E2	0.0306	α(K)=0.0227 *4*; α(L)=0.00602 *9*; α(M)=0.001441 *21* α(N)=0.000343 *5*; α(O)=5.15×10^{-5} *8*; α(P)=2.05×10^{-6} *3* Mult.: R(asym)=1.91 *8* (2006Sh23).
939.23	4^+	311.3 *5*	43 *14*	628.14	2^+			
		499.7 *2*	100 *14*	439.49	4^+			
		796.5 *10*	57 *28*	143.16	2^+	E2	0.00721	α(K)=0.00583 *9*; α(L)=0.001064 *16*; α(M)=0.000246 *4* α(N)=5.90×10^{-5} *9*; α(O)=9.29×10^{-6} *14*; α(P)=5.41×10^{-7} *8* Mult.: R(asym)=1.73 *12* (2006Sh23).
979.37	$2^{(-)}$	351.2 *1*	100	628.14	2^+	(E1)	0.01573	α(K)=0.01315 *19*; α(L)=0.00200 *3*; α(M)=0.000453 *7* α(N)=0.0001081 *16*; α(O)=1.722×10^{-5} *25*; α(P)=1.096×10^{-6} *16* Mult.: R(asym)=1.21 *8*; ΔJ=0 transition (2006Sh23) and the adopted level scheme.
		838[‡] *1*		143.16	2^+			
1070.7	$3^{(-)}$	91 *1*	<14	979.37	$2^{(-)}$			
		442.5 *10*	43 *14*	628.14	2^+			
		630.2 *10*	29 *14*	439.49	4^+			
		928.0 *5*	100 *28*	143.16	2^+	(E1)	0.00205	α(K)=0.001733 *25*; α(L)=0.000247 *4*; α(M)=5.54×10^{-5} *8* α(N)=1.330×10^{-5} *19*; α(O)=2.16×10^{-6} *3*; α(P)=1.519×10^{-7} *22* Mult.: R(asym)=0.64 *3* (2006Sh23) and the adopted level scheme.
1193.77	$4^{(-)}$	214.4 *1*	100	979.37	$2^{(-)}$	E2	0.245	α(K)=0.1399 *20*; α(L)=0.0795 *12*; α(M)=0.0197 *3* α(N)=0.00467 *7*; α(O)=0.000662 *10*; α(P)=1.123×10^{-5} *16* Mult.: R(asym)=1.27 *18* (2006Sh23).
1228.9	$2^+,3,4^+$	375.0 *5*	100 *20*	854.13	$(0^+,2,4^+)$			
		600.6 *10*	40 *20*	628.14	2^+			
		788.8 *10*	≈20	439.49	4^+			
1341.7	$5^{(-)}$	148[‡] *1*		1193.77	$4^{(-)}$			
		271.6 *10*	67 *33*	1070.7	$3^{(-)}$			
		469.4 *10*	67 *33*	871.10	6^+			
		903.0 *10*	100 *33*	439.49	4^+	(E1)	0.00216	α(K)=0.00182 *3*; α(L)=0.000260 *4*; α(M)=5.84×10^{-5} *9* α(N)=1.401×10^{-5} *20*; α(O)=2.28×10^{-6} *4*; α(P)=1.597×10^{-7} *23* Mult.: R(asym)=0.81 *5* (2006Sh23) and the adopted level scheme.

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Adopted Levels, Gammas (continued)

γ(^{188}W) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[†]	α[#]	Comments
1425.15	8^+	554.0 *2*	100	871.10	6^+	E2	0.01634	α(K)=0.01269 *18*; α(L)=0.00280 *4*; α(M)=0.000661 *10* α(N)=0.0001579 *23*; α(O)=2.42×10^{-5} *4*; α(P)=1.166×10^{-6} *17* Mult.: R(asym)=2.05 *20* (2006Sh23).
1533.77	$6^{(-)}$	340.0 *1*	100 *25*	1193.77	$4^{(-)}$	(E2)	0.0589	α(K)=0.0412 *6*; α(L)=0.01355 *19*; α(M)=0.00328 *5* α(N)=0.000781 *11*; α(O)=0.0001148 *17*; α(P)=3.60×10^{-6} *5* Mult.: R(asym)=1.03 *11*.
		662.5 *10*	≈25	871.10	6^+			
1538.2	(5^+)	344.3 *4*	67 *33*	1193.77	$4^{(-)}$			
		599.3 *10*	67 *33*	939.23	4^+			
		667.5 *10*	≈33	871.10	6^+			
		1099.0 *10*	100 *33*	439.49	4^+			
1728.7	$7^{(-)}$	195[‡] *1*		1533.77	$6^{(-)}$			
		303[‡] *1*		1425.15	8^+			
		387[‡] *1*		1341.7	$5^{(-)}$			
		858[‡] *1*		871.10	6^+			
1742.7	$7^{(-)}$	(14[‡])		1728.7	$7^{(-)}$			E_γ: Not observed but inferred from coincidence relationships (2010La16).
		209[‡] *1*		1533.77	$6^{(-)}$			
		317[‡] *1*		1425.15	8^+			
		401[‡] *1*		1341.7	$5^{(-)}$			E_γ: Also seen in ^{188}Ta β- decay, but not placed in the level scheme.
		872[‡] *1*		871.10	6^+			
1926.7	8^-	184[‡] *1*	100 *2*	1742.7	$7^{(-)}$	M1	0.841 *18*	α(K)=0.699 *15*; α(L)=0.1103 *23*; α(M)=0.0251 *6* α(N)=0.00605 *13*; α(O)=0.000987 *21*; α(P)=7.03×10^{-5} *15* B(M1)(W.u.)=1.72×10^{-5} *7* E_γ: Also seen in ^{188}Ta β- decay, but not placed in the level scheme. I_γ: From ^{186}W(^{136}Xe,Xγ). Mult.: From α_T(exp)=0.77 6 in 2010La16.
		198[‡] *1*	1.9 *7*	1728.7	$7^{(-)}$	[M1]	0.686 *14*	α(K)=0.570 *12*; α(L)=0.0898 *18*; α(M)=0.0204 *4* α(N)=0.00492 *10*; α(O)=0.000804 *16*; α(P)=5.73×10^{-5} *12* B(M1)(W.u.)=2.6×10^{-7} *10* I_γ: From ^{186}W(^{136}Xe,Xγ).
2274.4	(9^-)	348[‡] *1*		1926.7	8^-			
2665.9	(10^-)	392[‡] *1*		2274.4	(9^-)			
		739[‡] *1*		1926.7	8^-			
3086.7	(11^-)	421[‡] *1*		2665.9	(10^-)			
		812[‡] *1*		2274.4	(9^-)			

[†] From ^{186}W(^{18}O,^{16}Oγ), unless otherwise stated. Mult. are based on R(asym)=Iγ(in reaction plane)/Iγ(out of reaction plane), measured in 2006Sh23, and the corresponding band assignments. R(asym)>1 is expected for ΔJ=2, quadrupole or ΔJ=0, dipole and R(asym)<1 for ΔJ=1, dipole. For in-band transitions D=M1 and Q=E2 was assumed.

[‡] From ^{186}W(^{136}Xe,Xγ) (2010La16). E_γ uncertainty was assigned by the evaluator.

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Adopted Levels, Gammas (continued)

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

[#] 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.

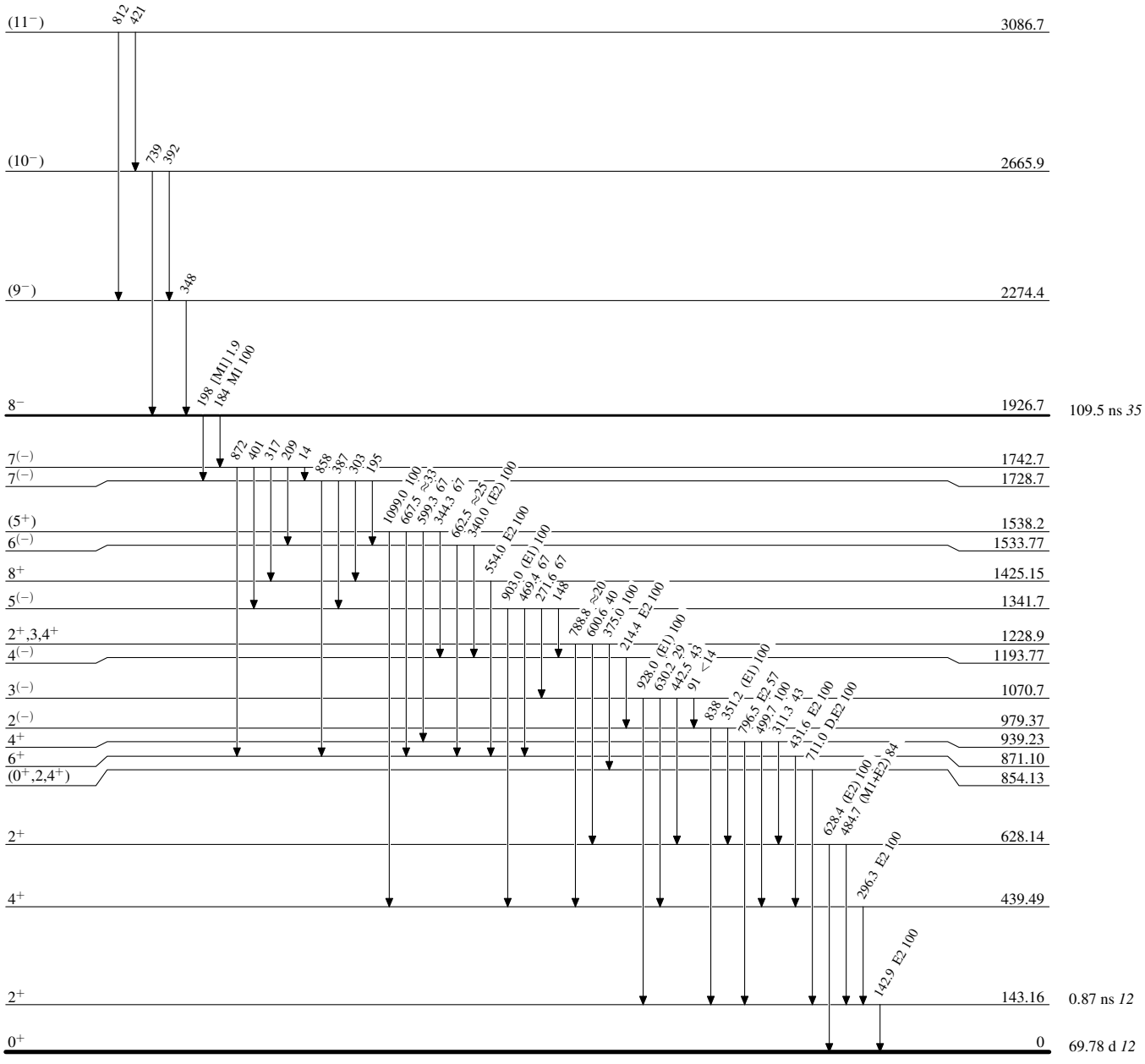
Adopted Levels, Gammas

Legend

Level Scheme

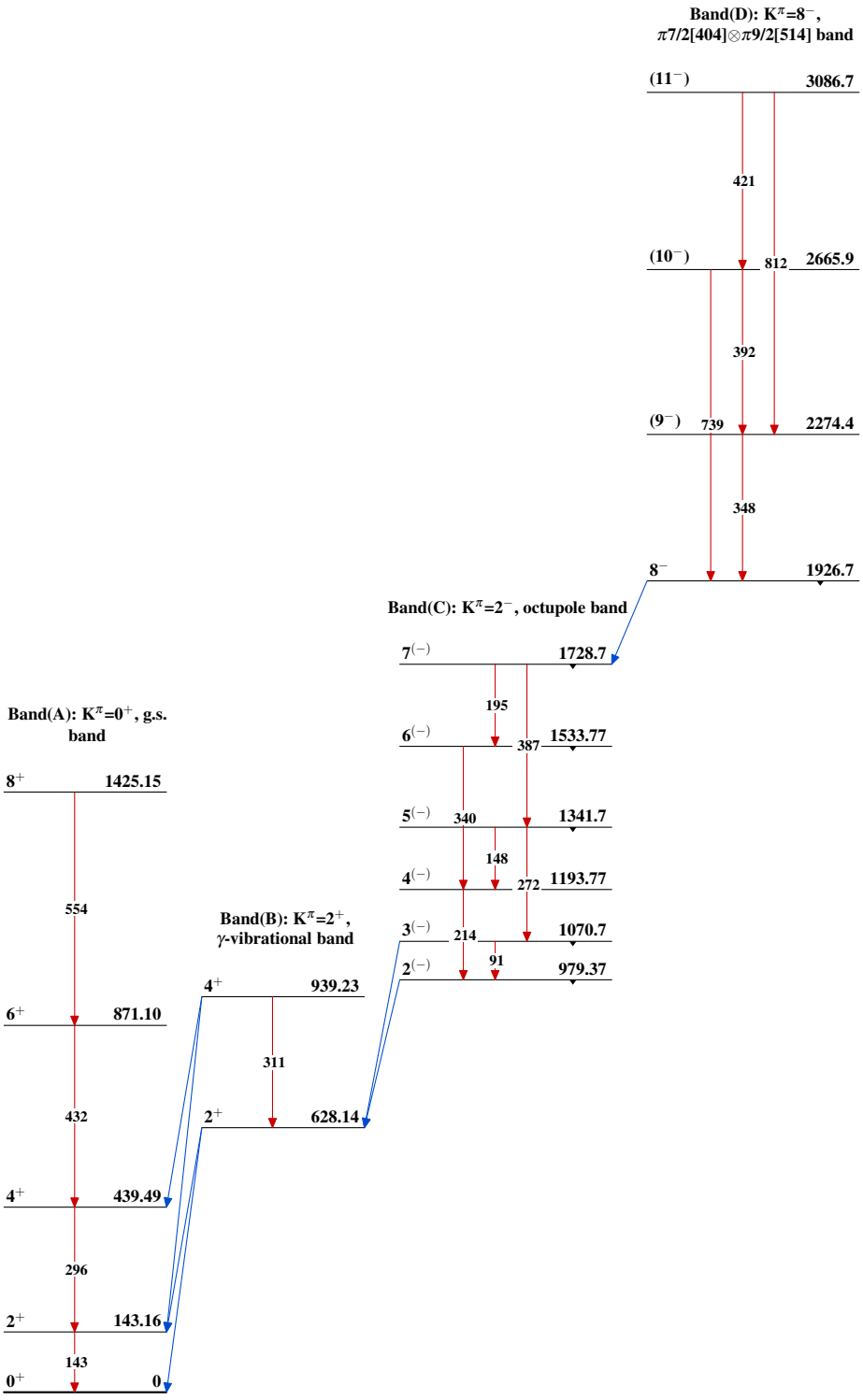
Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{188}_{74}W_{114}$

Adopted Levels, Gammas



$^{188}_{74}W_{114}$