^{173}Yb(^{19}F,4nγ) E=86 MeV 2010Fa19

History

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

2010Fa19: ^{173}Yb(^{19}F,4nγ). E=86, 90 MeV beams of ^{19}F from the Tandem accelerator facility at the Japan Atomic Energy Agency (JAEC) bombarded an enriched, 2.2 mg/cm^2 ^{173}Yb target. The target was backed on a 7.0 mg/cm^2 Pb foil. An array of 18 Compton suppressed HPGe detectors were used for the (x ray)γ-time and $\gamma\gamma$-time coincidences (GEMINI array). Measured: Eγ, Iγ, $\gamma\gamma$, (x ray)γ coin, $\gamma\gamma(\theta)$.

^{188}Au Levels

E(level)[†]	J$^\pi$[‡]	Comments
0+x[#]	(11$^-$)	Additional information 1. J$^\pi$: From Adopted Levels.
314.76+x[#] *10*	(12$^-$)	
447.74+x[#] *10*	(13$^-$)	
804.28+x[#] *12*	(14$^-$)	
1170.41+x[#] *12*	(15$^-$)	
1535.97+x[#] *13*	(16$^-$)	
1692.09+x[&] *15*	(15$^+$)	
1912.69+x[&] *18*	(16$^+$)	
1958.39+x[&] *18*	(17$^+$)	
1965.17+x[#] *15*	(17$^-$)	
2217.99+x[&] *20*	(18$^+$)	
2243.07+x *17*	(18$^-$)	
2255.3+x *4*		J$^\pi$: (17$^+$) in table I of 2010Fa19, not listed in authors' level-scheme figure 2.
2258.19+x *20*	(18$^+$)	
2258.19+y[@]	(20$^+$)	Additional information 2. E(level): this level is assumed to decay via two low-energy transitions to two (18$^+$) levels at 2217.99+x and 2258.19+x. The γ-rays are expected to be highly converted and lower than the energy threshold of the γ-detector array.
2344.5+x[#] *3*	(18$^-$)	
2448.6+x *7*		
2501.5+x[&] *4*	(19$^+$)	
2503.8+x[#] *3*	(19$^-$)	
2535.0+y *6*		
2734.6+y[@] *3*	(21$^+$)	
2753.1+x *8*		
2790.50+y[@] *10*	(22$^+$)	
2808.0+x *4*		J$^\pi$: (20$^-$) in table I of 2010Fa19, not listed in authors' level-scheme figure 2.
2823.8+x[&] *6*		
2873.4+x[#] *4*	(20$^-$)	
2938.1+x *8*		
3014.0+x[#] *5*	(21$^-$)	
3130.4+y *6*		
3143.1+x *5*		
3310.6+y[@] *3*	(23$^+$)	
3547.6+x *6*		
3567.6+y[@] *3*	(24$^+$)	
3575.3+x *7*		
3735.2+x *6*		

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^{173}Yb(^{19}F,4nγ) E=86 MeV 2010Fa19 (continued)

^{188}Au Levels (continued)

E(level)†	Jπ‡	Comments
4127.5+y@ 5	(25+)	
4216.2+x 8		
4386.0+y@ 5	(26+)	
4473.4+x 10		
z[a]	J	Additional information 3.
86.8+z[a] 3	J+1	
359.9+z[a] 3	J+2	
457.1+z[a] 3	J+3	
729.5+z[a] 4	J+4	
794.8+z[a] 3	J+5	
1215.7+z[a] 4	J+6	
1287.9+z[a] 4	J+7	
1806.0+z[a] 5	J+8	
1885.2+z[a] 4	J+9	
2483.2+z[a] 5	J+10	
2572.4+z[a] 5	J+11	
3328.9+z[a] 7	J+13	
u[b]	(10−)	Additional information 4.
328.3+u[b] 3	(12−)	
356.0+u[b] 4	(11−)	
688.2+u[b] 5	(13−)	
777.8+u[b] 4	(14−)	
1104.6+u[b] 5	(15−)	
1296.3+u[b] 6	(16−)	
1600.1+u[b] 6	(17−)	
1872.2+u[b] 8	(18−)	
2165.7+u[b] 8	(19−)	
2502.9+u[b] 9	(20−)	
2790.3+u[b] 10	(21−)	

† From a least-squares fit to Eγ data.
‡ From deduced transition multipolarities using γ(θ) data and the observed apparent band structures.
# Band(A): $\pi(h_{11/2})^{-1}\otimes\nu(i_{13/2})^{-1}$.
@ Band(B): $\pi(h_{11/2})^{-1}\otimes\nu(i^{-2}_{13/2}h^{-1}_{9/2})$.
& Band(C): $\pi(h_{11/2})^{-1}\otimes\nu(i^{-2}_{13/2},(p_{3/2}$ or $f_{5/2})^{-1})$.
[a] Band(D): Possible $\pi(h_{9/2})^{-1}\otimes\nu(p_{3/2}$ or $f_{5/2})^{-1})$ or $\pi(h_{11/2})^{-1}\otimes\nu(h_{9/2})^{-1}$.
[b] Band(E): Possible $\pi(h_{9/2})^{-1}\otimes\nu(i_{13/2})^{-1}$.

γ(^{188}Au)

Eγ‡	Ei(level)	J^π_i	Ef	J^π_f	Comments
y	2258.19+y	(20+)	2258.19+x	(18+)	
45.7@	1958.39+x	(17+)	1912.69+x	(16+)	Eγ: from level-energy difference. A transition seems to be present in level-scheme figure 2 of 2010Fa19.
65.3	794.8+z	J+5	729.5+z	J+4	Eγ: from level-energy difference; transition shown in level-scheme figure 2 of 2010Fa19.

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^{173}Yb(^{19}F,4nγ) E=86 MeV 2010Fa19 (continued)

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

E_γ[‡]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	α[#]	Comments
87.1 *5*	>7	86.8+z	J+1	z	J	M1+E2	10.76 *23*	α(K)=8.81 *19*; α(L)=1.50 *4*; α(M)=0.347 *8* α(N)=0.0865 *19*; α(O)=0.0159 *4*; α(P)=0.001073 *24* I_γ: listed as >8 *1*. Mult.: R_{ADO}=0.89 *15*.
97.7 *5*	>4	457.1+z	J+3	359.9+z	J+2	M1+E2	7.75 *16*	α(K)=6.36 *13*; α(L)=1.072 *22*; α(M)=0.249 *5* α(N)=0.0620 *13*; α(O)=0.01140 *24*; α(P)=0.000769 *16* I_γ: listed as >6 *2*. Mult.: R_{ADO}=0.68 *17*.
133.4 *3*	17 *2*	447.74+x	(13$^-$)	314.76+x	(12$^-$)	M1+E2	3.18	α(K)=2.61 *4*; α(L)=0.438 *7*; α(M)=0.1016 *16* α(N)=0.0253 *4*; α(O)=0.00465 *8*; α(P)=0.000314 *5* Mult.: R_{ADO}=0.66 *9*.
159.6 *5*	4.0 *9*	2503.8+x	(19$^-$)	2344.5+x	(18$^-$)	M1+E2	1.91 *4*	α(K)=1.57 *3*; α(L)=0.263 *5*; α(M)=0.0609 *11* α(N)=0.0152 *3*; α(O)=0.00279 *5*; α(P)=0.000189 *4* Mult.: R_{ADO}=0.87 *16*.
185.1 *5*	2 *1*	2938.1+x		2753.1+x				
205.1		3143.1+x		2938.1+x				E_γ: from level-scheme figure 2 in 2010Fa19, not listed in authors′ table I.
205.7		2448.6+x		2243.07+x	(18$^-$)			E_γ: from level-scheme figure 2 in 2010Fa19, not listed in authors′ table I.
206.1 *3*	10 *2*	3014.0+x	(21$^-$)	2808.0+x		M1+E2	0.934 *14*	α(K)=0.768 *12*; α(L)=0.1277 *19*; α(M)=0.0296 *5* α(N)=0.00738 *11*; α(O)=0.001357 *20*; α(P)=9.17×10^{-5} *14* Mult.: R_{ADO}=0.75 *13*.
220.6 *1*	58 *5*	1912.69+x	(16$^+$)	1692.09+x	(15$^+$)	M1+E2	0.773	α(K)=0.636 *9*; α(L)=0.1056 *15*; α(M)=0.0245 *4* α(N)=0.00610 *9*; α(O)=0.001122 *16*; α(P)=7.59×10^{-5} *11* Mult.: R_{ADO}=0.79 *6*.
243.4 *5*	2 *1*	2501.5+x	(19$^+$)	2258.19+x	(18$^+$)			
257.1 *5*	2 *1*	3567.6+y	(24$^+$)	3310.6+y	(23$^+$)			
257.2 *5*	4.0 *9*	4473.4+x		4216.2+x				
258.7 *5*	3 *1*	4386.0+y	(26$^+$)	4127.5+y	(25$^+$)			
259.6 *1*	30 *3*	2217.99+x	(18$^+$)	1958.39+x	(17$^+$)	M1+E2	0.493	α(K)=0.406 *6*; α(L)=0.0672 *10*; α(M)=0.01557 *22* α(N)=0.00388 *6*; α(O)=0.000713 *10*; α(P)=4.83×10^{-5} *7* Mult.: R_{ADO}=0.94 *8*.
266.3 *1*	20 *2*	1958.39+x	(17$^+$)	1692.09+x	(15$^+$)	E2	0.1470	α(K)=0.0833 *12*; α(L)=0.0480 *7*; α(M)=0.01218 *18* α(N)=0.00301 *5*; α(O)=0.000499 *7*; α(P)=8.77×10^{-6} *13* Mult.: R_{ADO}=1.12 10.
269.8 *5*	5 *1*	3143.1+x		2873.4+x	(20$^-$)	M1+E2	0.444	α(K)=0.365 *6*; α(L)=0.0604 *9*; α(M)=0.01399 *21* α(N)=0.00349 *6*; α(O)=0.000641 *10*; α(P)=4.34×10^{-5} *7* Mult.: R_{ADO}=0.86 *14*.
272.4 *3*	19 *3*	729.5+z	J+4	457.1+z	J+3	M1+E2	0.432 *7*	α(K)=0.356 *5*; α(L)=0.0588 *9*; α(M)=0.01363 *20* α(N)=0.00340 *5*; α(O)=0.000625 *9*;

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^{173}Yb(^{19}F,4nγ) E=86 MeV 2010Fa19 (continued)

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

E_γ[‡]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	α[#]	Comments
								α(P)=4.23×10^{-5} *6* Mult.: R_{ADO}=0.84 *12*.
273.1 *1*	>34	359.9+z	J+2	86.8+z	J+1	M1+E2	0.429	α(K)=0.353 *5*; α(L)=0.0584 *9*; α(M)=0.01353 *19* α(N)=0.00337 *5*; α(O)=0.000620 *9*; α(P)=4.20×10^{-5} *6* I_γ: listed as >37 *3*. Mult.: R_{ADO}=0.53 *6*.
276.8 *5*	1.0 *2*	2535.0+y		2258.19+x	(18$^+$)			
278.1 *5*	9 *2*	2243.07+x	(18$^-$)	1965.17+x	(17$^-$)	M1+E2	0.408	α(K)=0.336 *5*; α(L)=0.0555 *9*; α(M)=0.01287 *20* α(N)=0.00321 *5*; α(O)=0.000590 *9*; α(P)=3.99×10^{-5} *6* Mult.: R_{ADO}=0.92 *21*.
283.7 *5*	3 *1*	2501.5+x	(19$^+$)	2217.99+x	(18$^+$)			
299.8 *1*	33 *3*	2258.19+x	(18$^+$)	1958.39+x	(17$^+$)	M1+E2	0.333	α(K)=0.274 *4*; α(L)=0.0452 *7*; α(M)=0.01047 *15* α(N)=0.00261 *4*; α(O)=0.000480 *7*; α(P)=3.25×10^{-5} *5* Mult.: R_{ADO}=0.82 *7*.
303.7 *5*	1.0 *3*	1600.1+u	(17$^-$)	1296.3+u	(16$^-$)			
304.4 *3*	13 *3*	2808.0+x		2503.8+x	(19$^-$)	M1+E2	0.319	α(K)=0.263 *4*; α(L)=0.0433 *7*; α(M)=0.01004 *15* α(N)=0.00250 *4*; α(O)=0.000460 *7*; α(P)=3.12×10^{-5} *5* Mult.: R_{ADO}=0.87 *13*.
304.5 *5*	4 *1*	2753.1+x		2448.6+x		M1+E2	0.319	α(K)=0.262 *4*; α(L)=0.0433 *7*; α(M)=0.01003 *15* α(N)=0.00250 *4*; α(O)=0.000460 *7*; α(P)=3.11×10^{-5} *5* Mult.: R_{ADO}=0.77 *14*.
314.8 *1*	121 *9*	314.76+x	(12$^-$)	0+x	(11$^-$)	M1+E2	0.291	α(K)=0.240 *4*; α(L)=0.0395 *6*; α(M)=0.00916 *13* α(N)=0.00228 *4*; α(O)=0.000420 *6*; α(P)=2.84×10^{-5} *4* Mult.: R_{ADO}=0.83 *7*.
322.3 *5*	3 *1*	2823.8+x		2501.5+x	(19$^+$)			
326.9 *5*	2 *1*	1104.6+u	(15$^-$)	777.8+u	(14$^-$)	M1+E2	0.263	α(K)=0.217 *4*; α(L)=0.0357 *6*; α(M)=0.00826 *12* α(N)=0.00206 *3*; α(O)=0.000379 *6*; α(P)=2.57×10^{-5} *4* Mult.: R_{ADO}=0.36 *7*.
328.3 *3*	17 *2*	328.3+u	(12$^-$)	u	(10$^-$)	E2	0.0786	α(K)=0.0498 *7*; α(L)=0.0218 *4*; α(M)=0.00546 *8* α(N)=0.001348 *20*; α(O)=0.000226 *4*; α(P)=5.37×10^{-6} *8* Mult.: R_{ADO}=1.16 *11*.
332.2 *5*	4 *1*	688.2+u	(13$^-$)	356.0+u	(11$^-$)	E2	0.0760	α(K)=0.0484 *7*; α(L)=0.0208 *4*; α(M)=0.00522 *8* α(N)=0.001290 *20*; α(O)=0.000217 *4*; α(P)=5.22×10^{-6} *8* Mult.: R_{ADO}=1.3 *4*.
337.7 *1*	66 *5*	794.8+z	J+5	457.1+z	J+3	E2	0.0725	α(K)=0.0466 *7*; α(L)=0.0196 *3*; α(M)=0.00492 *7* α(N)=0.001215 *17*; α(O)=0.000204 *3*;

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^{173}Yb(^{19}F,4nγ) E=86 MeV 2010Fa19 (continued)

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

E_γ[‡]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	α[#]	Comments
								α(P)=5.03×10^{-6} *7* Mult.: R_{ADO}=1.17 *13*.
342.6 *3*	10 *1*	2255.3+x		1912.69+x	(16$^+$)	M1+E2	0.232	α(K)=0.191 *3*; α(L)=0.0314 *5*; α(M)=0.00727 *11* α(N)=0.00181 *3*; α(O)=0.000333 *5*; α(P)=2.26×10^{-5} *4* Mult.: R_{ADO}=0.88 *17*.
356.1 *5*	4 *1*	356.0+u	(11$^-$)	u	(10$^-$)	M1+E2	0.209	α(K)=0.1719 *25*; α(L)=0.0282 *4*; α(M)=0.00654 *10* α(N)=0.001630 *24*; α(O)=0.000300 *5*; α(P)=2.03×10^{-5} *3* Mult.: R_{ADO}=0.48 *6*.
356.6 *1*	135 *10*	804.28+x	(14$^-$)	447.74+x	(13$^-$)	M1+E2	0.208	α(K)=0.1713 *24*; α(L)=0.0281 *4*; α(M)=0.00652 *10* α(N)=0.001623 *23*; α(O)=0.000299 *5*; α(P)=2.03×10^{-5} *3* Mult.: R_{ADO}=0.89 *7*.
359.8 *3*	>17	359.9+z	J+2	z	J	E2	0.0607	α(K)=0.0400 *6*; α(L)=0.01565 *23*; α(M)=0.00391 *6* α(N)=0.000965 *14*; α(O)=0.0001632 *24*; α(P)=4.35×10^{-6} *7* I_γ: listed as >19 *2*. other: Iγ(359.8)/Iγ(273.1)=0.58 *13*. Mult.: R_{ADO}=1.11 *11*.
359.8 *5*	4 *1*	688.2+u	(13$^-$)	328.3+u	(12$^-$)	M1+E2	0.203	α(K)=0.1672 *25*; α(L)=0.0275 *4*; α(M)=0.00636 *10* α(N)=0.001585 *23*; α(O)=0.000292 *5*; α(P)=1.98×10^{-5} *3* Mult.: R_{ADO}=0.60 *9*.
365.7 *1*	25 *3*	1535.97+x	(16$^-$)	1170.41+x	(15$^-$)	M1+E2	0.194	α(K)=0.1601 *23*; α(L)=0.0263 *4*; α(M)=0.00609 *9* α(N)=0.001516 *22*; α(O)=0.000279 *4*; α(P)=1.89×10^{-5} *3* Mult.: R_{ADO}=0.79 *7*.
366.3 *1*	22 *3*	1170.41+x	(15$^-$)	804.28+x	(14$^-$)	M1+E2	0.193	α(K)=0.1594 *23*; α(L)=0.0262 *4*; α(M)=0.00606 *9* α(N)=0.001509 *22*; α(O)=0.000278 *4*; α(P)=1.88×10^{-5} *3* Mult.: R_{ADO}=0.80 *8*.
370.3 *1*	>37	457.1+z	J+3	86.8+z	J+1	E2	0.0561	α(K)=0.0374 *6*; α(L)=0.01415 *20*; α(M)=0.00352 *5* α(N)=0.000871 *13*; α(O)=0.0001476 *21*; α(P)=4.07×10^{-6} *6* I_γ: listed as >42 *5*. other: Iγ(370.3)/Iγ(97.7)=7.0 *7*. Mult.: R_{ADO}=1.30 *12*.
379.6 *5*	7 *2*	2344.5+x	(18$^-$)	1965.17+x	(17$^-$)	M1+E2	0.176 *3*	α(K)=0.1449 *21*; α(L)=0.0238 *4*; α(M)=0.00550 *8* α(N)=0.001370 *20*; α(O)=0.000252 *4*; α(P)=1.712×10^{-5} *25* Mult.: R_{ADO}=0.94 *17*.
395.8 *5*	4 *1*	3130.4+y		2734.6+y	(21$^+$)	M1+E2	0.1572 *23*	α(K)=0.1296 *19*; α(L)=0.0212 *3*; α(M)=0.00491 *7* α(N)=0.001224 *18*; α(O)=0.000225 *4*; α(P)=1.530×10^{-5} *22* Mult.: R_{ADO}=0.70 *11*.

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^{173}Yb(^{19}F,4nγ) E=86 MeV 2010Fa19 (continued)

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

E_γ[‡]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	α[#]	Comments
404.7 *5*	4 *1*	3547.6+x		3143.1+x		M1+E2	0.1481 *22*	α(K)=0.1221 *18*; α(L)=0.0200 *3*; α(M)=0.00463 *7* α(N)=0.001153 *17*; α(O)=0.000212 *3*; α(P)=1.441×10^{-5} *21* Mult.: R_{ADO}=0.66 *17*.
416.4 *5*	6 *1*	1104.6+u	(15$^-$)	688.2+u	(13$^-$)	E2	0.0410	α(K)=0.0284 *4*; α(L)=0.00949 *14*; α(M)=0.00234 *4* α(N)=0.000580 *9*; α(O)=9.91×10^{-5} *15*; α(P)=3.12×10^{-6} *5* Mult.: R_{ADO}=1.4 *3*.
420.8 *3*	15 *2*	1215.7+z	J+6	794.8+z	J+5	M1+E2	0.1335	α(K)=0.1101 *16*; α(L)=0.0180 *3*; α(M)=0.00417 *6* α(N)=0.001038 *15*; α(O)=0.000191 *3*; α(P)=1.298×10^{-5} *19* Mult.: R_{ADO}=0.53 *9*.
422.5 *3*	17 *2*	1958.39+x	(17$^+$)	1535.97+x	(16$^-$)	E1	0.01233	α(K)=0.01023 *15*; α(L)=0.001617 *23*; α(M)=0.000372 *6* α(N)=9.21×10^{-5} *13*; α(O)=1.661×10^{-5} *24*; α(P)=1.003×10^{-6} *15* Mult.: R_{ADO}=0.75 *9*.
429.7 *3*	13 *3*	1965.17+x	(17$^-$)	1535.97+x	(16$^-$)	M1+E2	0.1262	α(K)=0.1041 *15*; α(L)=0.01702 *24*; α(M)=0.00394 *6* α(N)=0.000981 *14*; α(O)=0.000181 *3*; α(P)=1.227×10^{-5} *18* Mult.: R_{ADO}=0.66 *11*.
432.2 *5*	4 *1*	3575.3+x		3143.1+x		M1+E2	0.1243	α(K)=0.1025 *15*; α(L)=0.01675 *24*; α(M)=0.00388 *6* α(N)=0.000966 *14*; α(O)=0.000178 *3*; α(P)=1.208×10^{-5} *18* Mult.: R_{ADO}=0.85 *17*.
447.7 *1*	162 *13*	447.74+x	(13$^-$)	0+x	(11$^-$)	E2	0.0340	α(K)=0.0241 *4*; α(L)=0.00748 *11*; α(M)=0.00184 *3* α(N)=0.000456 *7*; α(O)=7.82×10^{-5} *11*; α(P)=2.66×10^{-6} *4* Mult.: R_{ADO}=1.12 *14*. I_γ: other: Iγ(447.7)/Iγ(133.4)=8.8 *6*.
449.5 *3*	13 *2*	777.8+u	(14$^-$)	328.3+u	(12$^-$)	E2	0.0336	α(K)=0.0239 *4*; α(L)=0.00738 *11*; α(M)=0.00182 *3* α(N)=0.000450 *7*; α(O)=7.72×10^{-5} *11*; α(P)=2.64×10^{-6} *4* Mult.: R_{ADO}=1.26 *16*.
476.4 *3*	13 *1*	2734.6+y	(21$^+$)	2258.19+y	(20$^+$)	M1+E2	0.0961	α(K)=0.0793 *12*; α(L)=0.01291 *19*; α(M)=0.00299 *5* α(N)=0.000744 *11*; α(O)=0.0001370 *20*; α(P)=9.32×10^{-6} *14* Mult.: R_{ADO}=0.96 *12*.
481.0 *5*	4 *2*	4216.2+x		3735.2+x				
489.5 *3*	15 *2*	804.28+x	(14$^-$)	314.76+x	(12$^-$)	E2	0.0272	α(K)=0.0198 *3*; α(L)=0.00564 *8*; α(M)=0.001380 *20* α(N)=0.000342 *5*; α(O)=5.90×10^{-5} *9*; α(P)=2.19×10^{-6} *3* Mult.: R_{ADO}=1.24 *23*. I_γ: other: Iγ(489.5)/Iγ(356.6)=0.12 *1*.
493.1 *1*	52 *6*	1287.9+z	J+7	794.8+z	J+5	E2	0.0267	α(K)=0.0195 *3*; α(L)=0.00552 *8*;

Continued on next page (footnotes at end of table)

^{173}Yb(^{19}F,4nγ) E=86 MeV 2010Fa19 (continued)

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

E_γ[‡]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	α[#]	Comments
								α(M)=0.001349 *19* α(N)=0.000334 *5*; α(O)=5.77×10^{-5} *8*; α(P)=2.15×10^{-6} *3* Mult.: R_{ADO}=1.18 *11*.
495.5 *5*	5 *1*	1600.1+u	(17$^-$)	1104.6+u	(15$^-$)	E2	0.0264	α(K)=0.0192 *3*; α(L)=0.00543 *8*; α(M)=0.001328 *19* α(N)=0.000329 *5*; α(O)=5.69×10^{-5} *9*; α(P)=2.13×10^{-6} *3* Mult.: R_{ADO}=1.00 *23*.
509.8 *5*	2.0 *7*	3014.0+x	(21$^-$)	2503.8+x	(19$^-$)			
518.2 *5*	9 *2*	1806.0+z	J+8	1287.9+z	J+7	M1+E2	0.0770	α(K)=0.0635 *9*; α(L)=0.01033 *15*; α(M)=0.00239 *4* α(N)=0.000595 *9*; α(O)=0.0001095 *16*; α(P)=7.46×10^{-6} *11* Mult.: R_{ADO}=0.62 *15*.
518.4 *5*	9 *2*	1296.3+u	(16$^-$)	777.8+u	(14$^-$)	E2	0.0237	α(K)=0.01744 *25*; α(L)=0.00473 *7*; α(M)=0.001154 *17* α(N)=0.000286 *4*; α(O)=4.96×10^{-5} *7*; α(P)=1.93×10^{-6} *3* Mult.: R_{ADO}=1.13 *11*.
520.1 *3*	10 *1*	3310.6+y	(23$^+$)	2790.50+y	(22$^+$)	M1+E2	0.0762	α(K)=0.0629 *9*; α(L)=0.01023 *15*; α(M)=0.00237 *4* α(N)=0.000589 *9*; α(O)=0.0001085 *16*; α(P)=7.39×10^{-6} *11* Mult.: R_{ADO}=0.89 *10*.
532.3 *1*	27 *3*	2790.50+y	(22$^+$)	2258.19+y	(20$^+$)	E2	0.0222	α(K)=0.01647 *23*; α(L)=0.00437 *7*; α(M)=0.001064 *15* α(N)=0.000264 *4*; α(O)=4.58×10^{-5} *7*; α(P)=1.83×10^{-6} *3* Mult.: R_{ADO}=1.26 *13*.
538.5 *3*	13 *3*	2503.8+x	(19$^-$)	1965.17+x	(17$^-$)	E2	0.0216	α(K)=0.01606 *23*; α(L)=0.00423 *6*; α(M)=0.001027 *15* α(N)=0.000254 *4*; α(O)=4.42×10^{-5} *7*; α(P)=1.78×10^{-6} *3* Mult.: R_{ADO}=1.29 *18*. I_γ: other: Iγ(538.5)/Iγ(159.6)=3.5 *3*.
542.8 *5*	5 *1*	2501.5+x	(19$^+$)	1958.39+x	(17$^+$)			
560.1 *5*	4 *1*	4127.5+y	(25$^+$)	3567.6+y	(24$^+$)			
565.6 *5*	3 *1*	2165.7+u	(19$^-$)	1600.1+u	(17$^-$)	E2	0.0193	α(K)=0.01446 *21*; α(L)=0.00366 *6*; α(M)=0.000887 *13* α(N)=0.000220 *4*; α(O)=3.83×10^{-5} *6*; α(P)=1.605×10^{-6} *23* Mult.: R_{ADO}=1.09 *19*.
575.9 *5*	4 *2*	1872.2+u	(18$^-$)	1296.3+u	(16$^-$)	E2	0.0185	α(K)=0.01392 *20*; α(L)=0.00347 *5*; α(M)=0.000841 *12* α(N)=0.000208 *3*; α(O)=3.64×10^{-5} *6*; α(P)=1.546×10^{-6} *22* Mult.: R_{ADO}=1.17 *16*.
590.2 *5*	6 *2*	1806.0+z	J+8	1215.7+z	J+6	E2	0.01747	α(K)=0.01322 *19*; α(L)=0.00324 *5*; α(M)=0.000783 *12* α(N)=0.000194 *3*; α(O)=3.39×10^{-5} *5*; α(P)=1.468×10^{-6} *21* Mult.: R_{ADO}=1.1 *3*.
597.3 *1*	33 *4*	1885.2+z	J+9	1287.9+z	J+7	E2	0.01700	α(K)=0.01289 *18*; α(L)=0.00313 *5*; α(M)=0.000756 *11*

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^{173}Yb(^{19}F,4nγ) E=86 MeV 2010Fa19 (continued)

γ(^{188}Au) (continued)

E_γ[‡]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	α[#]	Comments
								α(N)=0.000187 *3*; α(O)=3.28×10^{-5} *5*; α(P)=1.432×10^{-6} *20* Mult.: R_{ADO}=1.22 *11*.
598.0 *5*	5 *2*	2483.2+z	J+10	1885.2+z	J+9			
624.6 *5*	2 *1*	2790.3+u	(21$^-$)	2165.7+u	(19$^-$)			E_γ: from table I of 2010Fa19. Eγ=624.9 in authors′ figure 2.
630.3 *3*	19 *3*	2873.4+x	(20$^-$)	2243.07+x	(18$^-$)	E2	0.01506	α(K)=0.01152 *17*; α(L)=0.00269 *4*; α(M)=0.000648 *10* α(N)=0.0001607 *23*; α(O)=2.82×10^{-5} *4*; α(P)=1.280×10^{-6} *18* Mult.: R_{ADO}=1.2 *3*.
630.7 *5*	2 *1*	2502.9+u	(20$^-$)	1872.2+u	(18$^-$)	E2	0.01503	α(K)=0.01151 *17*; α(L)=0.00269 *4*; α(M)=0.000647 *10* α(N)=0.0001604 *23*; α(O)=2.82×10^{-5} *4*; α(P)=1.279×10^{-6} *18* Mult.: R_{ADO}=1.4 *5*.
674.1 *5*	3.0 *4*	3547.6+x		2873.4+x	(20$^-$)			
677.1 *5*	5 *2*	2483.2+z	J+10	1806.0+z	J+8			
687.2 *3*	16 *3*	2572.4+z	J+11	1885.2+z	J+9	E2	0.01245	α(K)=0.00965 *14*; α(L)=0.00213 *3*; α(M)=0.000511 *8* α(N)=0.0001266 *18*; α(O)=2.24×10^{-5} *4*; α(P)=1.072×10^{-6} *15* Mult.: R_{ADO}=1.2 *2*.
694.5		3143.1+x		2448.6+x		E2	0.01217	α(K)=0.00945 *14*; α(L)=0.00207 *3*; α(M)=0.000496 *7* α(N)=0.0001231 *18*; α(O)=2.17×10^{-5} *3*; α(P)=1.049×10^{-6} *15* Mult.: R_{ADO}=1.24 *24*.
707.1 *1*	28 *5*	2243.07+x	(18$^-$)	1535.97+x	(16$^-$)	E2	0.01170	α(K)=0.00911 *13*; α(L)=0.00198 *3*; α(M)=0.000473 *7* α(N)=0.0001173 *17*; α(O)=2.07×10^{-5} *3*; α(P)=1.012×10^{-6} *15* Mult.: R_{ADO}=1.21 *15*. I_γ: other: Iγ(707.1)/Iγ(278.1)=2.9 *3*.
722.6 *1*	65 *5*	1170.41+x	(15$^-$)	447.74+x	(13$^-$)	E2	0.01117	α(K)=0.00872 *13*; α(L)=0.00187 *3*; α(M)=0.000446 *7* α(N)=0.0001107 *16*; α(O)=1.96×10^{-5} *3*; α(P)=9.69×10^{-7} *14* Mult.: R_{ADO}=1.19 *10*. I_γ: other: Iγ(722.6)/Iγ(366.6)=2.22 *22*.
731.6 *1*	29 *3*	1535.97+x	(16$^-$)	804.28+x	(14$^-$)	E2	0.01088	α(K)=0.00851 *12*; α(L)=0.00181 *3*; α(M)=0.000432 *6* α(N)=0.0001072 *15*; α(O)=1.90×10^{-5} *3*; α(P)=9.45×10^{-7} *14* Mult.: R_{ADO}=1.08 *11*. I_γ: other: Iγ(731.6)/Iγ(365.7)=1.16 *12*.
756.5 *5*	5 *2*	3328.9+z	J+13	2572.4+z	J+11	E2	0.01014	α(K)=0.00796 *12*; α(L)=0.001663 *24*; α(M)=0.000396 *6* α(N)=9.82×10^{-5} *14*; α(O)=1.744×10^{-5} *25*; α(P)=8.83×10^{-7} *13* Mult.: R_{ADO}=1.2 *3*.
777.1 *3*	10 *1*	3567.6+y	(24$^+$)	2790.50+y	(22$^+$)	E2	0.00958	α(K)=0.00755 *11*; α(L)=0.001554 *22*; α(M)=0.000369 *6*

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^{173}Yb(^{19}F,4nγ) E=86 MeV 2010Fa19 (continued)

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

E_γ[‡]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	α[#]	Comments
								α(N)=9.16×10^{-5} *13*; α(O)=1.629×10^{-5} *23*; α(P)=8.37×10^{-7} *12* Mult.: R_{ADO}=1.07 *13*.
794.7 *1*	21 *3*	1965.17+x	(17$^-$)	1170.41+x	(15$^-$)	E2	0.00914	α(K)=0.00722 *11*; α(L)=0.001469 *21*; α(M)=0.000349 *5* α(N)=8.65×10^{-5} *13*; α(O)=1.541×10^{-5} *22*; α(P)=8.01×10^{-7} *12* Mult.: R_{ADO}=1.07 *12*.
808.6 *3*	19 *4*	2344.5+x	(18$^-$)	1535.97+x	(16$^-$)	E2	0.00882	I_γ: other: Iγ(794.7)/Iγ(429.7)=3.2 *3*. α(K)=0.00698 *10*; α(L)=0.001407 *20*; α(M)=0.000334 *5* α(N)=8.28×10^{-5} *12*; α(O)=1.476×10^{-5} *21*; α(P)=7.74×10^{-7} *11* Mult.: R_{ADO}=1.3 *3*.
818.1 *5*	5 *1*	4386.0+y	(26$^+$)	3567.6+y	(24$^+$)	E2	0.00861	I_γ: other: Iγ(808.6)/Iγ(379.6)=2.6 *6*. α(K)=0.00682 *10*; α(L)=0.001367 *20*; α(M)=0.000324 *5* α(N)=8.04×10^{-5} *12*; α(O)=1.434×10^{-5} *21*; α(P)=7.56×10^{-7} *11* Mult.: R_{ADO}=1.4 *3*.
861.8 *5*	5.0 *8*	3735.2+x		2873.4+x	(20$^-$)			
887.8 *1*	100 *8*	1692.09+x	(15$^+$)	804.28+x	(14$^-$)	E1	0.00275	α(K)=0.00230 *4*; α(L)=0.000344 *5*; α(M)=7.86×10^{-5} *11* α(N)=1.95×10^{-5} *3*; α(O)=3.56×10^{-6} *5*; α(P)=2.35×10^{-7} *4* Mult.: R_{ADO}=0.75 *6*. The absence of transition to the (13$^-$) level would argue against Mult.=M1.

† From 2010Fa19. $R_{ADO}(\gamma)$=Iγ(40°)/Iγ(98°), extracted from γ-ray intensities at 40° and 98° in the coin spectra gated by γ transitions (on the y axis) of any multipolarity in the two matrices sorted from $\gamma\gamma$ coin data: γ rays detected at all angles (y axis) against those observed at 47°, 147° (x axis) for one matrix and against those observed at 90° and 105° (x axis) for the second matrix. Expected R_{ADO} >1 for ΔJ=2, quadrupole (E2), with an average value of 1.16 *15* for known transitions and significantly <1 for ΔJ=1, dipole transitions. The apparent band structures were also used to assign Mult.

‡ From 2010Fa19 where Δ(Eγ)=0.1-0.5 keV was quoted, depending on Iγ. Uncertainties assigned here are as follows: 0.1 keV for Iγ>20, 0.3 keV for Iγ=10-20, and 0.5 keV for Iγ<10.

Additional information 5.

@ Placement of transition in the level scheme is uncertain.

^{173}Yb(^{19}F,4nγ) E=86 MeV 2010Fa19

Level Scheme

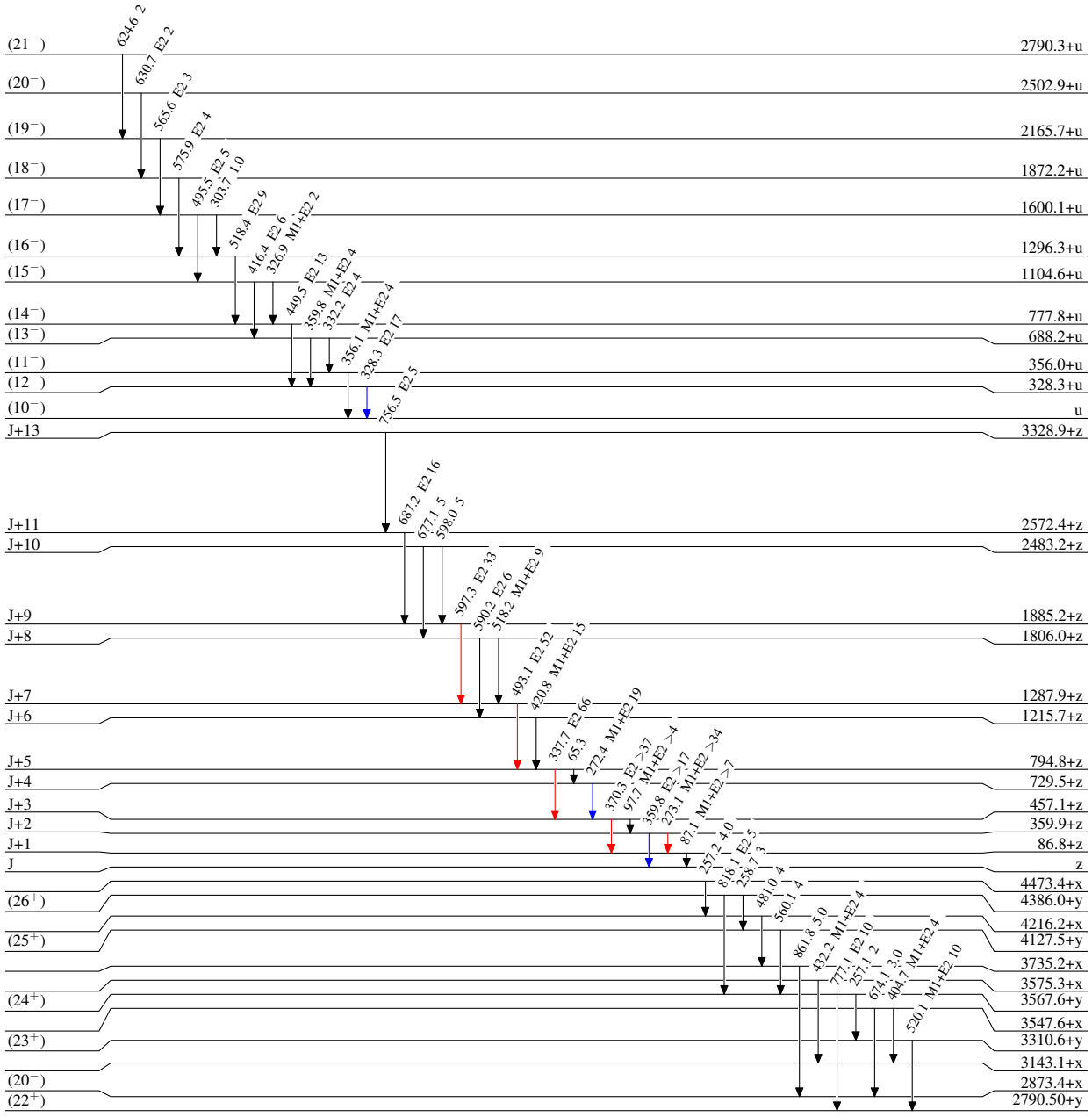
Intensities: Relative I_γ

Legend

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

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

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



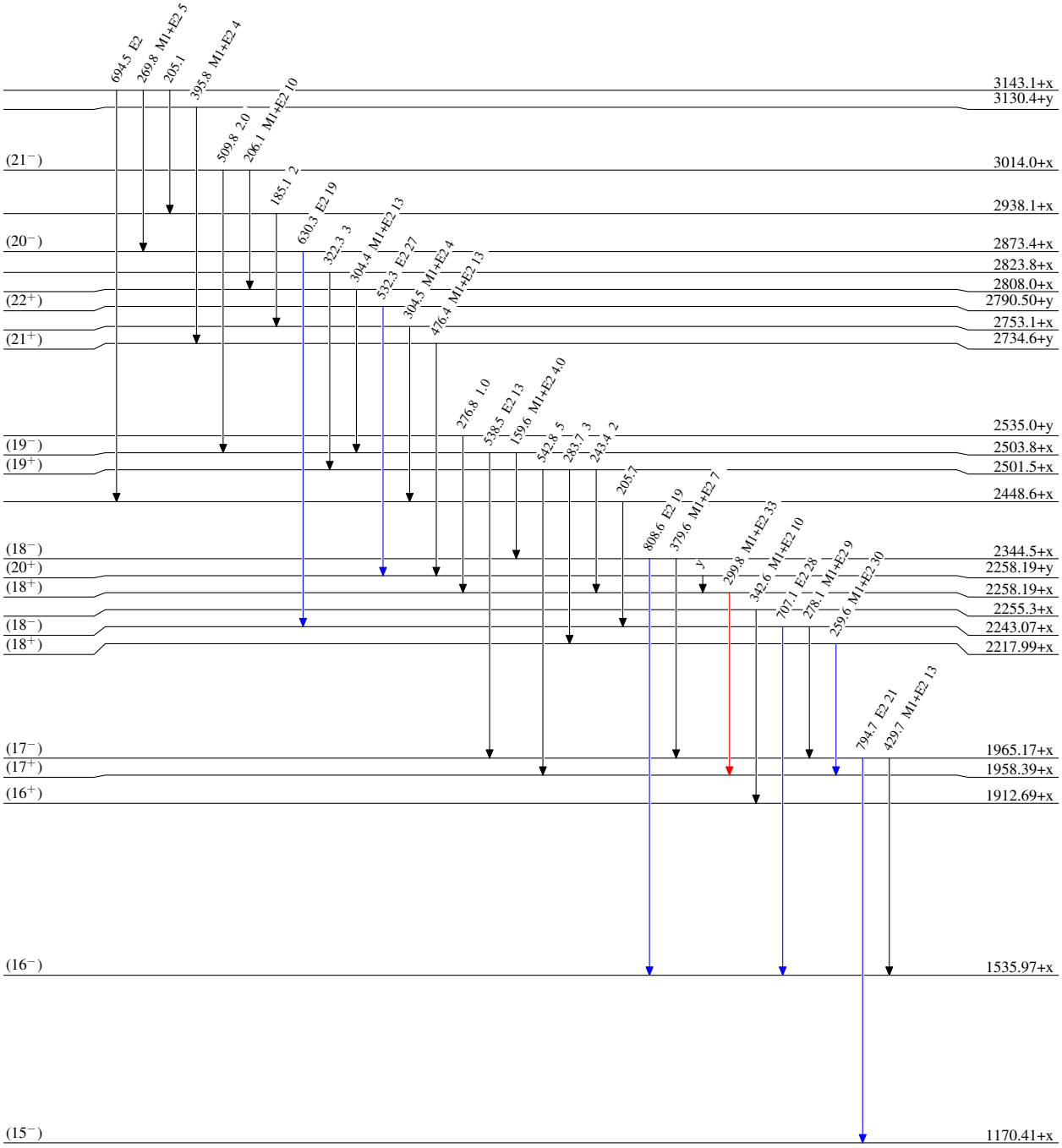
$^{188}_{79}Au_{109}$

^{173}Yb(^{19}F,4nγ) E=86 MeV 2010Fa19

Level Scheme (continued)

Intensities: Relative I_γ

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



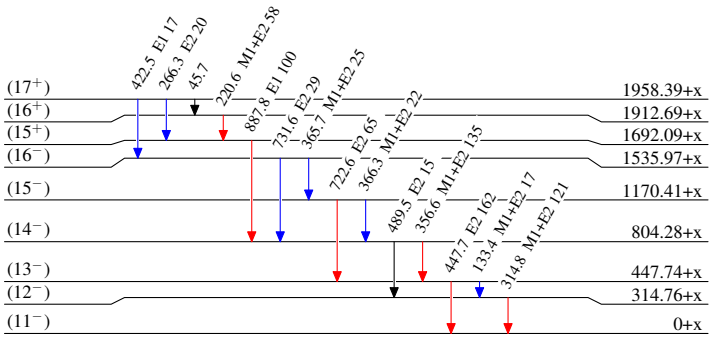
$^{188}_{79}Au_{109}$

^{173}Yb(^{19}F,4nγ) E=86 MeV 2010Fa19

Level Scheme (continued)

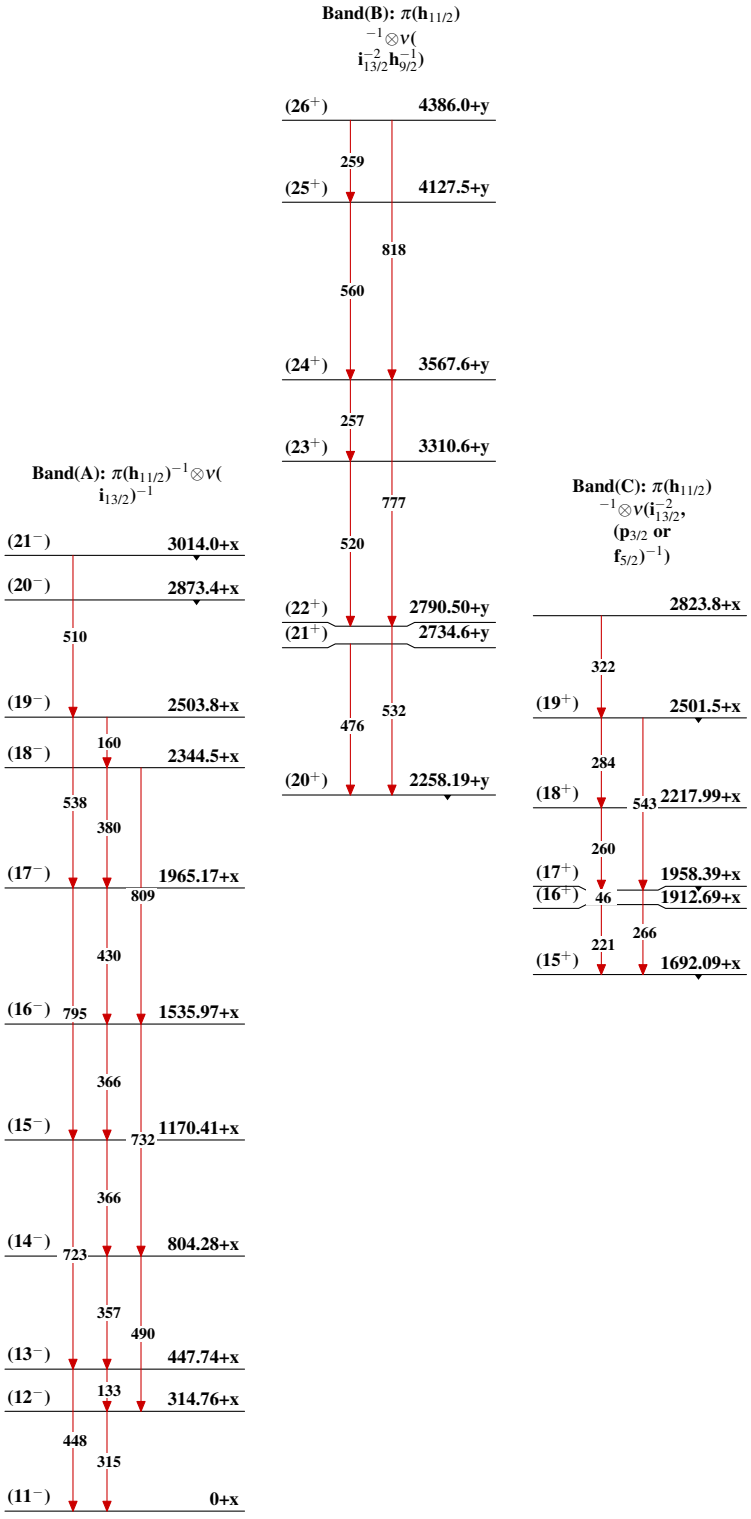
Intensities: Relative I_γ

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)



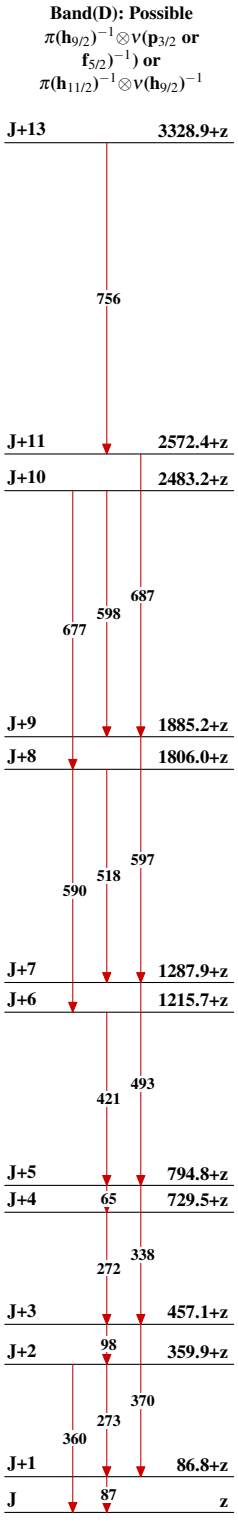
$^{188}_{79}Au_{109}$

^{173}Yb(^{19}F,4nγ) E=86 MeV 2010Fa19



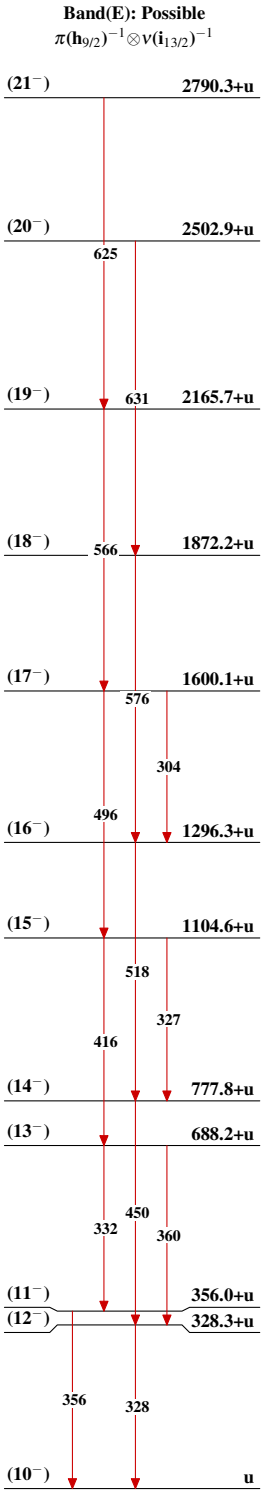
$^{188}_{79}Au_{109}$

^{173}Yb(^{19}F,4nγ) E=86 MeV 2010Fa19 (continued)



$^{188}_{79}Au_{109}$

^{173}Yb(^{19}F,4nγ) E=86 MeV 2010Fa19 (continued)



$^{188}_{79}Au_{109}$