Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 141, 1 (2017)	1-Feb-2017

Q(β^-)=−7534 (syst) *358*; S(n)=9645 (syst) *247*; S(p)=−448 *13*; Q(α)=6124 *4* 2017Wa10
Q(ε)=10936 (syst) *197*; S(2n)=21448 (syst) *247*; S(2p)=2045 *13*; Q(εp)=7985 (syst) *196* 2017Wa10
Additional information 1.

^{158}Ta Levels

Cross Reference (XREF) Flags

- A ^{158}Ta IT decay:6.1 μs
- B ^{162}Re α decay (107 ms)
- C ^{162}Re α decay (77 ms)
- D ^{102}Pd(^{58}Ni,pnγ)

E(level)[†]	J$^\pi$[‡]	$T_{1/2}$	XREF	Comments
0.0	(2$^-$)	55 ms *15*	B	%α≈91; %ε+%β^+≈9 J$^\pi$: From 1997Da07 and based on suggested series of α branches between (2$^-$) levels from ^{166}Ir to ^{154}Lu. $T_{1/2}$: From consideration of 46 ms *4* (1996Pa01) and 72 ms *12* (1997Da07). %α: From gross beta-decay theory (1997Mo25), $T_{1/2}$ for the ε+β+ decay is ≈ 0.61 s.
141 *9*	(9$^+$)	36.7 ms *15*	A CD	%α=95 *5*; %ε+%β^+=5 *5* Additional information 2. J$^\pi$: From 1997Da07 and based on suggested series of α branches between (9$^+$) levels from ^{166}Ir to ^{154}Lu. $T_{1/2}$: From average of 36.8 ms *16* (1997Ho10), 35 ms *1* (1996Pa01), and 37.7 ms *15* (1997Da07). %α: From 93% *6* (1979Ho10), 99% *13* (1996Pa01), and 100% *8* (1997Da07). Measured Eα=6048 *5* (1997Da07). Possible configuration=$\pi h_{11/2}\otimes\nu f_{7/2}$ based on that for 9$^+$ isomers in neighboring nuclei (2016Ca15 cite 1997Da07).
207.10[#] *20*	(10$^+$)		A CD	
919.50 *10*	(11$^+$)		A D	J$^\pi$: interpreted by 2016Ca15 (^{102}Pd(^{58}Ni,pnγ)) as $\pi h^3_{11/2}\otimes\nu f^3_{7/2}$ in analogy with 11$^+$ and 13$^+$ states in ^{152}Ho and ^{154}Tm (13$^+$ not found).
923.2? *8*			A D	
953.40[#] *22*	(12$^+$)		A D	
1358.5? *8*			A D	
1391.88 *24*			A D	
1551.53[#] *24*	(14$^+$)		A D	
1804.2[#] *3*	(16$^+$)		A D	
1824.92 *25*			A D	
2025.47 *25*			A D	
2098.2 *3*	(16$^+$)		A D	J$^\pi$: stretched E3 γ from (19$^-$).
2387.2 *3*	(17$^+$)		A D	
2601.6 *3*			D	
2805.5[@] *4*	(19$^-$)	6.1 μs *1*	A D	%α=1.4 *2* (2014Ca03); %IT=98.6 *2* E(level): same physical level is placed 2805.5 *4* in the ^{102}Pd(^{58}Ni,pnγ) dataset and at 2809.2 *14* in the IT decay dataset, because of the systematic differences in between the energies of otherwise (physically) the same transitions (the Eγ's are 0.5 to 1 keV higher in the IT decay). Possible configuration=$\pi h^{-3}_{11/2}\otimes\nu(f_{7/2},h_{9/2},i_{13/2})$ (2014Ca03, 2016Ca15). An α peak observed at 8644 keV *11* from this isomer, assignment based on

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Adopted Levels, Gammas (continued)

^{158}Ta Levels (continued)

E(level)[†]	XREF	Comments
		correlated γ rays with this α line. No protons were observed from this isomer, even though allowed by decay Q value. $T_{1/2}$: From γ(t) (2014Ca03).
2853.8 *4*	D	
2877.9 *4*	D	
2938.3? *3*	D	
2959.7 *3*	D	
3021.4 *3*	D	
3063.2[@] *4*	D	
3330.0 *4*	D	
3387.5[@] *4*	D	
3626.6 *4*	D	
3676.2[&] *3*	D	
3776.0[@] *4*	D	
3794.1 *4*	D	
3851.4 *4*	D	
4088.3[&] *3*	D	
4349.4 *3*	D	
4613.5[&] *3*	D	
4645.0 *4*	D	
4652.2 *4*	D	
4779.1 *4*	D	
4955.9 *4*	D	
4996.2[&] *4*	D	
5064.8 *5*	D	
5142.2[&] *4*	D	
5229.2 *4*	D	
5362.1 *4*	D	
5415.3 *4*	D	
5628.9 *4*	D	
6166.0 *4*	D	
6259.3 *4*	D	
6619.2? *4*	D	
6781.7 *5*	D	

[†] Deduced from least-squares fit to Eγ data. Reduced χ^2=3.4 is lager than critical χ^2=1.8 at 95% confidence level, probably due to underestimated uncertainty of 0.1 keV for many γ rays, especially for some unresolved structures. Five Eγ values deviate by 2-3 σ from the fitted values.

[‡] Above (9^+): from measured stretched multipolarities and increasing spin values with increasing energy excitation based on the heavy-ion reaction type.

[#] Band(A): γ cascade based on 10^+. Configuration=$\pi h_{11/2}\otimes\nu(f^2_{7/2}h_{9/2})$ (2014Ca03).

[@] Band(B): γ cascade based on 19^- isomer.

[&] Band(C): γ cascade based on 3676.5 level.

Adopted Levels, Gammas (continued)

γ(^{158}Ta)

E_i(level)	J_i^π	E_γ [†]	I_γ [‡]	E_f	J_f^π	Mult.[#]	α[d]	Comments
207.10	(10$^+$)	66.1[&] *2*	100	141	(9$^+$)	(M1)	2.46	α(L)=1.90 *4*; α(M)=0.432 *8* α(N)=0.1034 *18*; α(O)=0.0164 *3*; α(P)=0.001130 *19* Mult.: From intensity balance arguments (^{158}Ta IT decay, 2014Ca03).
919.50	(11$^+$)	778.5 *1*	100	141	(9$^+$)	(E2)[b]	0.00723	α(K)=0.00586 *9*; α(L)=0.001057 *15*; α(M)=0.000244 *4* α(N)=5.80×10^{-5} *9*; α(O)=8.85×10^{-6} *13*; α(P)=5.03×10^{-7} *7*
923.2?		782.2[&] *10*	100	141	(9$^+$)			
953.40	(12$^+$)	(33.9[@])		919.50	(11$^+$)	(M1)	17.52	α(L)=13.57 *19*; α(M)=3.08 *5* α(N)=0.737 *11*; α(O)=0.1165 *17*; α(P)=0.00804 *12*
		746.3 *1*	100	207.10	(10$^+$)	(E2)[b]	0.00792	α(K)=0.00640 *9*; α(L)=0.001176 *17*; α(M)=0.000271 *4* α(N)=6.45×10^{-5} *9*; α(O)=9.83×10^{-6} *14*; α(P)=5.49×10^{-7} *8*
1358.5?		435.3 *1*	100	923.2?				
1391.88		(33.4[@])		1358.5?				E_γ: possible transition discussed in text (2016Ca15), not shown in authors′ level scheme (Fig. 3).
		438.5 *1*	100	953.40	(12$^+$)			
1551.53	(14$^+$)	159.5[f] *2*	2.0 *2*	1391.88				placement based on level-energy difference (IT decay dataset).
		598.1 *1*	100	953.40	(12$^+$)	(E2)[b]	0.01306	α(K)=0.01031 *15*; α(L)=0.00212 *3*; α(M)=0.000494 *7* α(N)=0.0001172 *17*; α(O)=1.757×10^{-5} *25*; α(P)=8.79×10^{-7} *13*
1804.2	(16$^+$)	252.9 *1*	100	1551.53	(14$^+$)	(E2)[b]	0.1387	α(K)=0.0886 *13*; α(L)=0.0382 *6*; α(M)=0.00935 *14* α(N)=0.00220 *3*; α(O)=0.000305 *5*; α(P)=6.76×10^{-6} *10* E_γ: level-energy difference=252.7.
1824.92		273.1[e] *1*	100[e]	1551.53	(14$^+$)			E_γ: unresolved triplet, placed from 1825, 2099 and 5415 levels. E_γ: level-energy difference=273.4.
		434[f]		1391.88				
2025.47		200.2 *2*	10.0 *6*	1824.92				
		474.0 *1*	39.8 *11*	1551.53	(14$^+$)			
		633.7 *2*	100 *8*	1391.88				
2098.2	(16$^+$)	(72.7[@])		2025.47				
		273.1[e] *1*	100[e]	1824.92				
2387.2	(17$^+$)	583.0[a] *2*	100	1804.2	(16$^+$)	(M1)	0.0350	α(K)=0.0293 *5*; α(L)=0.00444 *7*; α(M)=0.001003 *14* α(N)=0.000240 *4*; α(O)=3.81×10^{-5} *6*; α(P)=2.68×10^{-6} *4*
2601.6		503.3 *1*	100.0 *13*	2098.2	(16$^+$)			
		797.6 *2*	31.5 *15*	1804.2	(16$^+$)			
2805.5	(19$^-$)	418.5[c] *7*	4.8[c] *6*	2387.2	(17$^+$)	(M2)	0.278	α(K)=0.223 *4*; α(L)=0.0425 *7*; α(M)=0.00990 *15* α(N)=0.00238 *4*; α(O)=0.000373 *6*; α(P)=2.46×10^{-5} *4* B(M2)(W.u.)=0.00054 *8*

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Adopted Levels, Gammas (continued)

γ(^{158}Ta) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π	Mult.[#]	α[d]	Comments
2805.5	(19$^-$)	708.1[c] *9*	11.7[c] *8*	2098.2	(16$^+$)	(E3)	0.0224	B(E3)(W.u.)=0.146 *13* α(K)=0.01644 *24*; α(L)=0.00460 *7*; α(M)=0.001103 *17* α(N)=0.000262 *4*; α(O)=3.85×10^{-5} *6*; α(P)=1.598×10^{-6} *23*
		1001.6[c] *11*	100[c] *5*	1804.2	(16$^+$)	(E3)	0.00949	B(E3)(W.u.)=0.110 *8* α(K)=0.00745 *11*; α(L)=0.001568 *23*; α(M)=0.000367 *6* α(N)=8.75×10^{-5} *13*; α(O)=1.325×10^{-5} *19*; α(P)=7.01×10^{-7} *10*
2853.8		466.6 *2*	100	2387.2	(17$^+$)			
2877.9		1052.5 *3*	100 *8*	1824.92				
		1074.1 *3*	84 *8*	1804.2	(16$^+$)			
2938.3?		336.6 *1*	100	2601.6				
2959.7		357.9[e] *2*	100.0[e] *17*	2601.6				
		572.6 *3*	5.2 *13*	2387.2	(17$^+$)			
		861.4 *2*	39.2 *13*	2098.2	(16$^+$)			
3021.4		1217.5 *2*	100	1804.2	(16$^+$)			
3063.2		257.7 *1*	100	2805.5	(19$^-$)			
3330.0		266.8[e] *1*	100[e]	3063.2				E_γ: unresolved doublet, placed from 3330 and 5629 levels.
3387.5		324.3 *1*	100	3063.2				
3626.6		296.6 *1*	100	3330.0				
3676.2		655.2 *2*	10.0 *8*	3021.4				
		716.5 *1*	100.0 *11*	2959.7				
		737.7 *2*	20.3 *8*	2938.3?				
3776.0		388.5 *1*	100	3387.5				
3794.1		406.6[a] *1*	100	3387.5				
3851.4		830.0 *12*	100	3021.4				
		893[f]		2959.7				
4088.3		236.9 *1*	11.9 *4*	3851.4				
		412.1 *1*	100.0 *8*	3676.2				
4349.4		261.0 *1*	100	4088.3				
4613.5		525.2 *1*	100	4088.3				
4645.0		868.9 *2*	100	3776.0				
4652.2		876.3 *2*	100	3776.0				
4779.1		1003.1 *2*	100	3776.0				
4955.9		606.3 *1*	100	4349.4				
4996.2		382.8 *1*	100	4613.5				
5064.8		1288.8 *3*	100	3776.0				
5142.2		146.0 *1*	100	4996.2				
5229.2		576.5 *3*	35 *8*	4652.2				
		583.7[a] *2*	100 *19*	4645.0				E_γ: level-energy difference=584.2.
5362.1		366.3 *2*	65 *4*	4996.2				
		406.1[a] *1*	100 *11*	4955.9				
		1013.4 *3*	71 *5*	4349.4				E_γ: level-energy difference=1012.7.
5415.3		185.9 *1*	20.4 *10*	5229.2				
		273.1[e] *1*	100.0[e] *14*	5142.2				
		350[f]		5064.8				
		636.7 *7*	19 *9*	4779.1				
		763.5 *2*	19.1 *14*	4652.2				
		770.7 *2*	40.5 *14*	4645.0				E_γ: level-energy difference=770.3.
5628.9		266.8[e] *1*	100[e]	5362.1				
6166.0		1023.8 *2*	100	5142.2				
6259.3		844.0 *2*	100	5415.3				

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Adopted Levels, Gammas (continued)

$\gamma(^{158}Ta)$ (continued)

E_i(level)	E_γ [†]	I_γ [‡]	E_f
6619.2?	1203.9[f] *2*	100	5415.3
6781.7	615.7 *2*	100	6166.0

† From ^{102}Pd(^{58}Ni,pnγ) dataset (2016Ca15) that are more precise than those from IT decay, which are systematically 0.5 to 1 keV higher in energy.
‡ Values from ^{102}Pd(^{58}Ni,pnγ) dataset (2016Ca15).
# From ^{158}Ta IT decay:6.1 μs dataset (2016Ca15, 2014Ca03) based on intensity balance arguments and transition rates for expected level lifetime, except where noted. Only pure multipolarities were assumed.
@ γ not observed, its existence required by $\gamma\gamma$-coin data. Energy was deduced from difference of connecting levels.
& From 2016Ca15 (Table II) for delayed γ rays from the 6.1−μs isomer.
a 583.0+583.7 and 406.1+406.6 form unresolved doublets; however, based on $\gamma\gamma$-coin data, separated intensities are assigned.
b From consistency with angular correlation data in 2016Ca15, although, no data are provided, reason for which the assignments are still to be confirmed by futher study.
c From the IT decay dataset.
d Additional information 3.
e Multiply placed with undivided intensity.
f Placement of transition in the level scheme is uncertain.

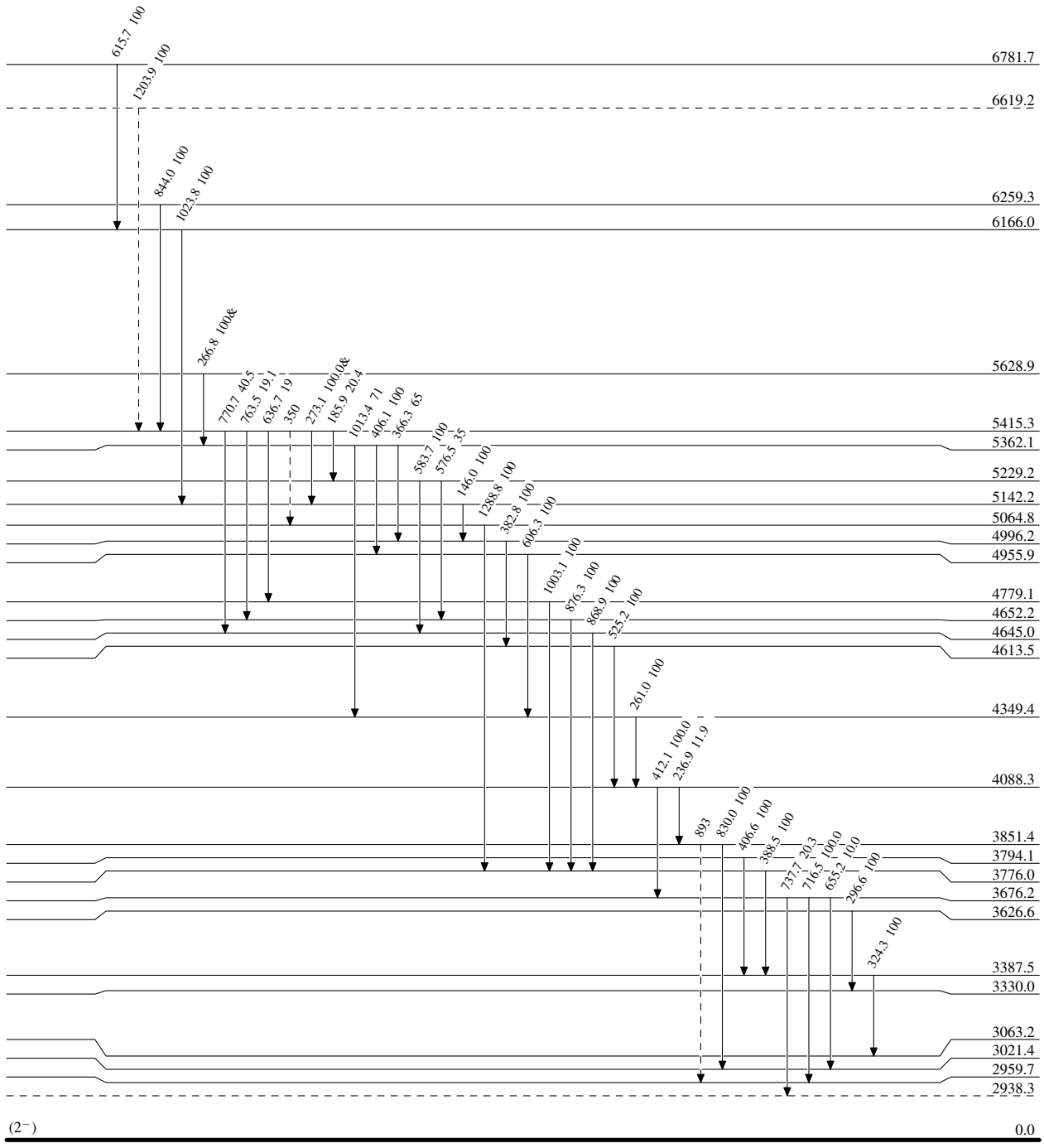
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

- - - - - - ► γ Decay (Uncertain)



$^{158}_{73}Ta_{85}$

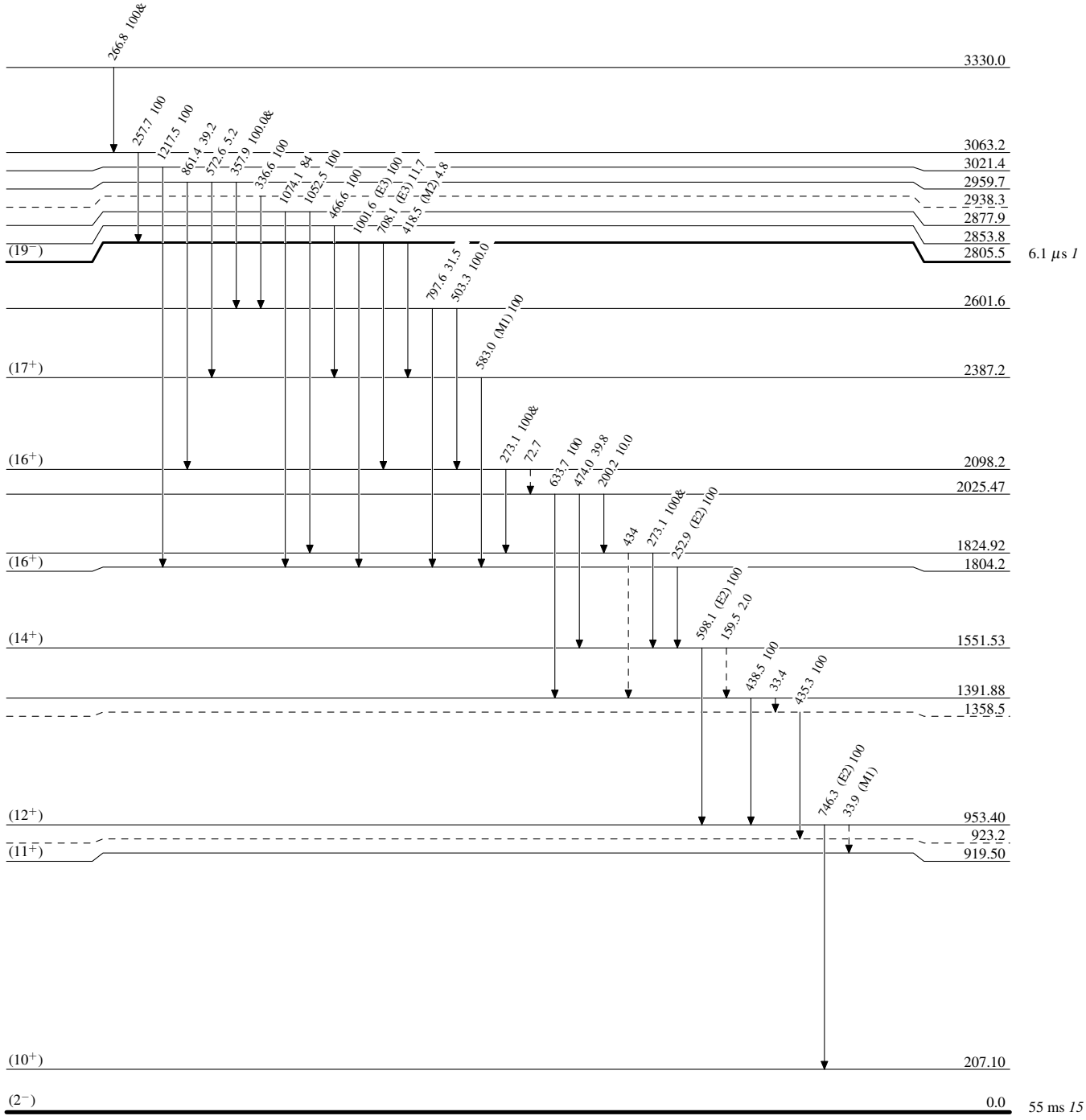
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

γ Decay (Uncertain)

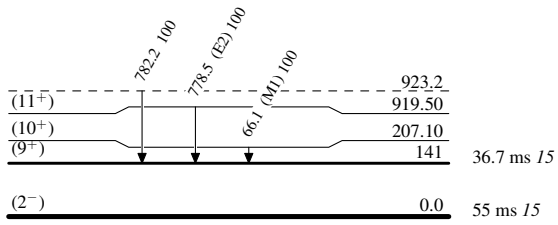


$^{158}_{73}Ta_{85}$

Adopted Levels, Gammas

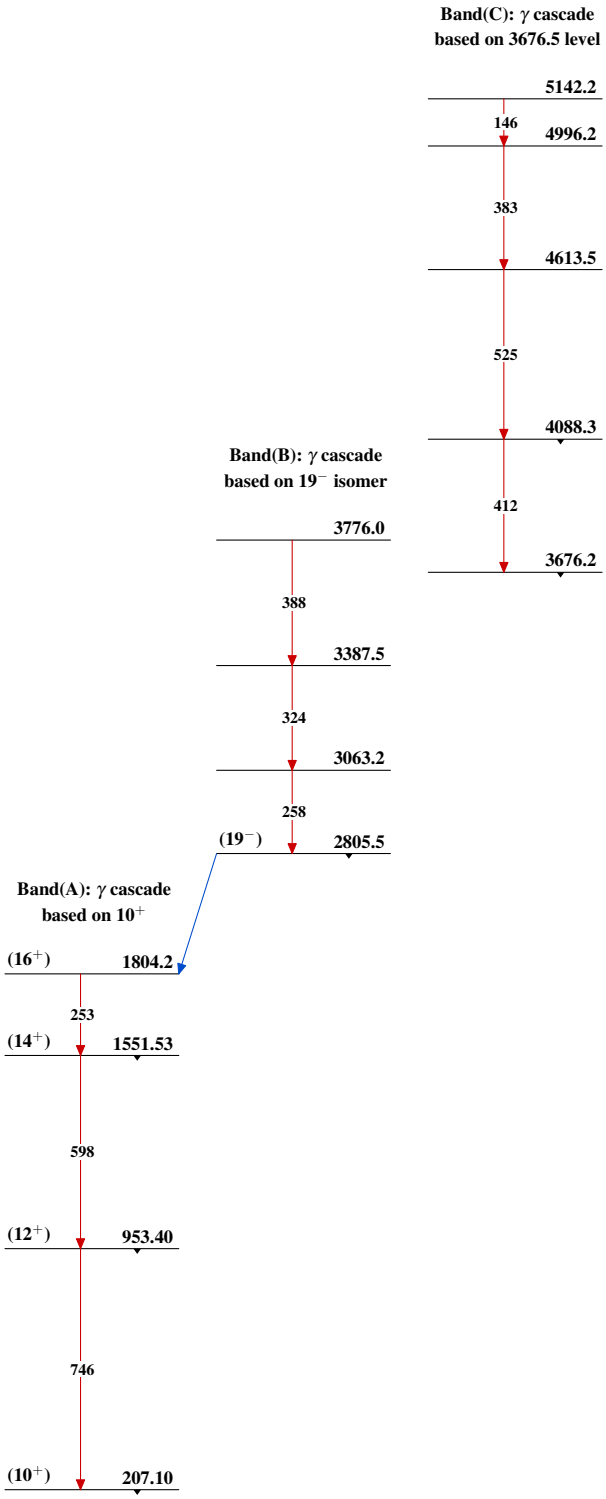
Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given



$^{158}_{73}Ta_{85}$

Adopted Levels, Gammas



$^{158}_{73}Ta_{85}$