Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	A. K. Jain (a), R. Raut (b), J. K. Tuli	NDS 110,1409 (2009)	1-Dec-2008

Q(β^-)=−2.03×10^3 *8*; S(n)=5755 *12*; S(p)=5213 *7*; Q(α)=6921.4 *22* 2012Wa38

Note: Current evaluation has used the following Q record −2.0×10^3 7 *5757* 12 *5213* 6 *6921.4* *21* 2003Au03.

Theoretical calculations in 2007Mi30, 2002Ts01, 1995De13, 1993De18, 1991Cw01, 1989Cw03.

Detailed spectroscopic studies on ^{225}Th was carried out using the reaction ^{226}Ra(α,5n) at a beam energy of 50 MeV. The measurements could establish the level structure of the nucleus upto an excitation energy of 2494 keV and spin 39/2$\hbar$. Parity doublets were observed and classified according to simplex (s) quantum number. The results were compared with theoretical calculations in interpreting the nuclear shape. However, the relative excitation of the s=+i band with respect to the ground state could not be established experimentally (1990Hu04).

The level observed at 102 keV in the α-decay, not observed in 1990Hu04. Interpretations in 1988Le13.

^{225}Th Levels

For given s, π=− has greater effective moment of inertia than π=+. For given π, s=−i has larger effective moment of inertia than s=+i, for rotation frequencies <0.18 Mev. For each s, effective moment of inertia converge at a common value.

Cross Reference (XREF) Flags

A ^{229}U α decay
B ^{226}Ra(α,5nγ)

E(level)†	J$^\pi$‡	T$_{1/2}$	XREF	Comments
0.0#	(3/2$^+$)	8.75 min *4*	AB	%α≈90; %ε≈10 J$^\pi$: Assumed to be same as that of the ground state of 223Ra, measured in 1983Ah03 and 1986Sh02. Assignment supported by measurements in 1989Ac01 and theoretical calculations in 1989Cw03, 1985Na07, 1984Le04, 1982Le19.
68.4#	(7/2$^+$)		AB	
187.0#	(11/2$^+$)		AB	
325.6@	(13/2$^-$)		B	
370.2#	(15/2$^+$)		B	
519.7@	(17/2$^-$)		B	
614.3#	(19/2$^+$)		B	
768.7@	(21/2$^-$)		B	
910.7#	(23/2$^+$)		B	
1072.2@	(25/2$^-$)		B	
1251.3#	(27/2$^+$)		B	
1426.3@	(29/2$^-$)		B	
1631.8#	(31/2$^+$)		B	
1824.5@	(33/2$^-$)		B	
2047.2?#	(35/2$^+$)		B	
2259.1?@	(37/2$^-$)		B	
2494.4?#	(39/2$^+$)		B	
x&	(5/2$^+$)		AB	E(level): Adjustment of energies of (5/2$^+$) and (9/2$^+$) states under the constraint that the difference between their energies must remain constant (103 keV) yielded x=31 keV.
x+103.5&	(9/2$^+$)		AB	E(level): Adjustment of energies of (5/2$^+$) and (9/2$^+$) states under the constraint that

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{225}Th Levels (continued)

E(level)[†]	J$^{\pi}$[‡]	XREF	Comments
			the difference between their energies must remain constant (103 keV) yielded E(9/2$^+$)=135 keV.
x+222.8[a]	(11/2$^-$)	B	
x+271.1[&]	(13/2$^+$)	B	
x+401.6[a]	(15/2$^-$)	B	
x+498.1[&]	(17/2$^+$)	B	
x+636.5[a]	(19/2$^-$)	B	
x+775.6[&]	(21/2$^+$)	B	
x+925.2[a]	(23/2$^-$)	B	
x+1096[&]	(25/2$^+$)	B	
x+1259.3[a]	(27/2$^-$)	B	
x+1454.2?[&]	(29/2$^+$)	B	
x+1626.3?[a]	(31/2$^-$)	B	
x+1839.1?[&]	(33/2$^+$)	B	
x+2020.1?[a]	(35/2$^-$)	B	

[†] From 1990Hu04.
[‡] From 1990Hu04. Deduced under the assumption of stretched transition.
[#] Band(A): s=−i, π=+ band.
[@] Band(B): s=−i, π=− band.
[&] Band(C): s=+i, π=+ band.
[a] Band(D): s=+i, π=− band.

γ(^{225}Th)

E$_i$(level)	J$_i^{\pi}$	E$_\gamma$[†]	I$_\gamma$	E$_f$	J$_f^{\pi}$	Mult.[‡]	α[#]	Comments
68.4	(7/2$^+$)	68.4	100[@]	0.0	(3/2$^+$)	[E2]	68.0	E$_\gamma$: From the level scheme of 1990Hu04. Not listed in the table.
187.0	(11/2$^+$)	118.6	100[@]	68.4	(7/2$^+$)	E2	5.36 *8*	(L1+L2)/L3=1.8 *2*
325.6	(13/2$^-$)	138.6[&] *2*	100	187.0	(11/2$^+$)	E1	0.226 *4*	ce(L1)+ce(L2)≈0.03 I$_\gamma$: Iγ(103 gate)=39 *4*, Iγ(118 gate)=47 *5*.
370.2	(15/2$^+$)	44.9 *2*		325.6	(13/2$^-$)			I$_\gamma$: Iγ(103 gate)=3.0 *6*, Iγ(118 gate)=10 *2*.
		183.2 *2*		187.0	(11/2$^+$)	E2	0.914 *14*	(L1+L2)/L3=2.3 *2* I$_\gamma$: Iγ(103 gate)=6.4 *7* Iγ(118 gate)=21.
519.7	(17/2$^-$)	149.4 *2*		370.2	(15/2$^+$)	E1	0.189 *3*	ce(L1)+ce(L2)≈0.03 I$_\gamma$: Iγ(103 gate)=18 *2*, Iγ(118 gate)=38 *4*.
		194.1[&] *2*		325.6	(13/2$^-$)			I$_\gamma$: Iγ(103 gate)=2.1 *7*, Iγ(118 gate)=3.3 *12*.
614.3	(19/2$^+$)	94.8 *2*		519.7	(17/2$^-$)	E1	0.1351 *21*	ce(L1)+ce(L2)<0.15 I$_\gamma$: Iγ(103 gate)=11.7 *12*, Iγ(118 gate)=24 *4*.
		244.1 *2*		370.2	(15/2$^+$)	E2	0.327 *5*	(L1+L2)/L3=2.2 *6* I$_\gamma$: Iγ(103 gate)=3.6 *4*, Iγ(118 gate)=14.0 *14*.
768.7	(21/2$^-$)	154.2 *2*		614.3	(19/2$^+$)	E1	0.175 *3*	ce(L1)+ce(L2)<0.06 I$_\gamma$: Iγ(103 gate)=9.0 *9*, Iγ(118 gate)=26 *3*.
		249.0 *2*		519.7	(17/2$^-$)			I$_\gamma$: Iγ(103 gate)=3.6 *4*, Iγ(118 gate)=5.9 *6*.
910.7	(23/2$^+$)	141.8 *2*		768.7	(21/2$^-$)	E1	0.214 *3*	ce(L1)+ce(L2)<0.06 I$_\gamma$: Iγ(103 gate)=5.0 *5*, Iγ(118 gate)=14.9 *15*.
		296.4 *2*		614.3	(19/2$^+$)			I$_\gamma$: Iγ(103 gate)=≈2, Iγ(118 gate)=6.1 *12*.
1072.2	(25/2$^-$)	161.9 *2*		910.7	(23/2$^+$)	E1	0.1558 *23*	ce(L1)+ce(L2)<0.06 I$_\gamma$: Iγ(103 gate)=3.8 *5*, Iγ(118 gate)=12.3 *12*.
		303.5 *2*		768.7	(21/2$^-$)			I$_\gamma$: Iγ(103 gate)=5.3 *8*, Iγ(118 gate)=8.9 *9*.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

$\gamma(^{225}Th)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ	E_f	J_f^π	Mult.[‡]	α[#]	Comments
1251.3	(27/2$^+$)	178.8[&] *2*		1072.2	(25/2$^-$)			I_γ: Iγ(103 gate)=2.9 *4*, Iγ(118 gate)=7.0 *7*.
		340.6 *5*		910.7	(23/2$^+$)			I_γ: Iγ(103 gate)=0.9 *3*, Iγ(118 gate)=4.7 *7*.
1426.3	(29/2$^-$)	174.9 *2*		1251.3	(27/2$^+$)			I_γ: Iγ(103 gate)=4.4 *8*, Iγ(118 gate)=5.9 *6*.
		354.1 *2*		1072.2	(25/2$^-$)			I_γ: Iγ(103 gate)=1.4 *5*, Iγ(118 gate)=4.7 *5*.
1631.8	(31/2$^+$)	205.4 *2*		1426.3	(29/2$^-$)			I_γ: Iγ(103 gate)=5.2 *7*, Iγ(118 gate)=4.7 *10*.
		380.5 *5*		1251.3	(27/2$^+$)			I_γ: Iγ(103 gate)=0.5 *3*, Iγ(118 gate)=2.4 *4*.
1824.5	(33/2$^-$)	193.1[a] *2*		1631.8	(31/2$^+$)			I_γ: Iγ(103 gate)=8.4 *13*, Iγ(118 gate)=8.1 *12*.
		398.2 *5*		1426.3	(29/2$^-$)			I_γ: Iγ(103 gate)=1.1 *3*, Iγ(118 gate)=2.4 *4*.
2047.2?	(35/2$^+$)	222.7[a] *5*		1824.5	(33/2$^-$)			I_γ: Iγ(103 gate)=0.8 *4*, Iγ(118 gate)=2.9 *6*.
		415.4[a] *5*		1631.8	(31/2$^+$)			I_γ: Iγ(103 gate)=1.6 *4*, Iγ(118 gate)=1.2 *3*.
2259.1?	(37/2$^-$)	211.6[&a] *2*		2047.2?	(35/2$^+$)			I_γ: Iγ(103 gate)=2.7 *3*, Iγ(118 gate)=2.5 *3*.
		434.6[a] *5*		1824.5	(33/2$^-$)			I_γ: Iγ(103 gate)=1.0 *3*, Iγ(118 gate)=1.4 *3*.
2494.4?	(39/2$^+$)	234.9[&a] *2*		2259.1?	(37/2$^-$)			I_γ: Iγ(103 gate)=3.9 *4*, Iγ(118 gate)=2.4 *4*.
		447.2[a] *5*		2047.2?	(35/2$^+$)			I_γ: Iγ(103 gate)=0.7 *2*, Iγ(118 gate)=1.2 *3*.
x+103.5	(9/2$^+$)	103.5	100[@]	x	(5/2$^+$)	E2	9.60 *14*	(L1+L2)/L3=1.7 *2*
x+222.8	(11/2$^-$)	119.3 *2*	100[@]	x+103.5	(9/2$^+$)	E1	0.323 *5*	ce(L1)+ce(L2)<0.15
								I_γ: Iγ(103 gate)=30 *3*.
x+271.1	(13/2$^+$)	48.1 *2*		x+222.8	(11/2$^-$)			I_γ: Iγ(103 gate)=16 *3*.
		167.6 *2*		x+103.5	(9/2$^+$)	E2	1.288 *19*	(L1+L2)/L3=1.9 *3*
								I_γ: Iγ(103 gate)=13 *1*.
x+401.6	(15/2$^-$)	131.1 *2*		x+271.1	(13/2$^+$)	E1	0.258 *4*	ce(L1)+ce(L2)≈0.03
								I_γ: Iγ(103 gate)=28 *3*, Iγ(118 gate)=9.5 *10*.
		178.8[&a] *2*		x+222.8	(11/2$^-$)			I_γ: Iγ(103 gate)=2.9 *4*, Iγ(118 gate)=7.0 *7*.
x+498.1	(17/2$^+$)	95.9 *2*		x+401.6	(15/2$^-$)	E1	0.1311 *20*	ce(L1)+ce(L2)<0.15
								I_γ: Iγ(103 gate)=27 *3*, Iγ(118 gate)=8 *3*.
		227.0 *2*		x+271.1	(13/2$^+$)	E2	0.419 *6*	(L1+L2)/L3=2.4 *6*
								I_γ: Iγ(103 gate)=11 *2*, Iγ(118 gate)=3.4 *11*.
x+636.5	(19/2$^-$)	138.6[&] *2*		x+498.1	(17/2$^+$)	E1	0.226 *4*	ce(L1)+ce(L2)≈0.03
								I_γ: Iγ(103 gate)=39 *4*, Iγ(118 gate)=47 *5*.
		234.9[&] *2*		x+401.6	(15/2$^-$)			I_γ: Iγ(103 gate)=3.9 *4*, Iγ(118 gate)=2.4 *4*.
x+775.6	(21/2$^+$)	138.6[&] *2*		x+636.5	(19/2$^-$)	E1	0.226 *4*	ce(L1)+ce(L2)≈0.03
								I_γ: Iγ(103 gate)=39 *4*, Iγ(118 gate)=47 *5*.
		277.5 *2*		x+498.1	(17/2$^+$)			I_γ: Iγ(103 gate)=7.1 *7*, Iγ(118 gate)=2.5 *5*.
x+925.2	(23/2$^-$)	149.8		x+775.6	(21/2$^+$)			
		288.7 *5*		x+636.5	(19/2$^-$)			I_γ: Iγ(103 gate)=5.2 *5*, Iγ(118 gate)=0.8 *4*.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

γ(^{225}Th) (continued)

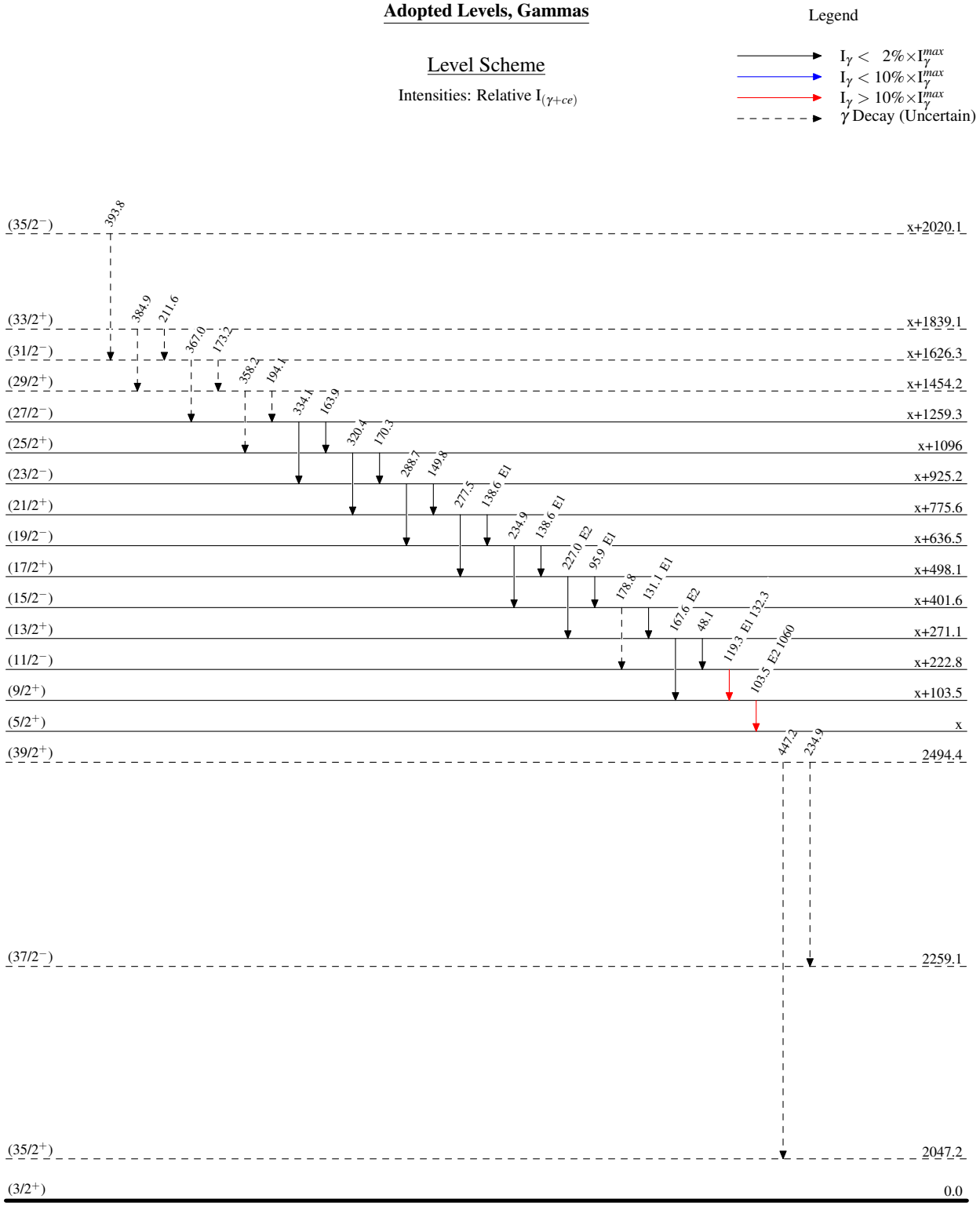
E_i(level)	J_i^π	E_γ[†]	E_f	J_f^π	Comments
x+1096	(25/2$^+$)	170.3 *2*	x+925.2	(23/2$^-$)	I_γ: Iγ(103 gate)=8.5 *9*, Iγ(118 gate)=7.8 *8*.
		320.4 *2*	x+775.6	(21/2$^+$)	I_γ: Iγ(103 gate)=4.2 *6*, Iγ(118 gate)=2.1 *3*.
x+1259.3	(27/2$^-$)	163.9 *2*	x+1096	(25/2$^+$)	I_γ: Iγ(103 gate)=1.9 *4*, Iγ(118 gate)=2.3 *3*.
		334.1 *2*	x+925.2	(23/2$^-$)	I_γ: Iγ(103 gate)=3.5 *4*, Iγ(118 gate)=1.2 *3*.
x+1454.2?	(29/2$^+$)	194.1[&a] *2*	x+1259.3	(27/2$^-$)	I_γ: Iγ(103 gate)=2.1 *7*, Iγ(118 gate)=3.3 *12*.
		358.2[a] *5*	x+1096	(25/2$^+$)	I_γ: Iγ(103 gate)=1.8 *9*, Iγ(118 gate)=1.1 *4*.
x+1626.3?	(31/2$^-$)	173.2[a] *2*	x+1454.2?	(29/2$^+$)	I_γ: Iγ(103 gate)=7.5 *10*, Iγ(118 gate)=6.7 *7*.
		367.0[a] *2*	x+1259.3	(27/2$^-$)	I_γ: Iγ(103 gate)=3.8 *4*, Iγ(118 gate)=2.8 *3*.
x+1839.1?	(33/2$^+$)	211.6[&a] *2*	x+1626.3?	(31/2$^-$)	I_γ: Iγ(103 gate)=2.7 *3*, Iγ(118 gate)=2.5 *3*.
		384.9[a] *5*	x+1454.2?	(29/2$^+$)	I_γ: Iγ(103 gate)=1.2 *3*, Iγ(118 gate)=0.9 *3*.
x+2020.1?	(35/2$^-$)	393.8[a] *5*	x+1626.3?	(31/2$^-$)	I_γ: Iγ(103 gate)=1.3 *3*, Iγ(118 gate)=0.6 *3*.

[†] Uncertainty in γ-energies is 0.2 keV for strong lines and upto 0.5 keV for weak lines. Lines with intensities around 1.0 has been considered as weak lines in this dataset.
[‡] Multipolarities from conversion electron measurements, (L1+L2)/L3 intensity ratios and (L1+L2) conversion coefficients.
[#] Calculated using bricc, assuming stretched transitions, according to 1990Hu04.
[@] Set 100 (β. Singh).
[&] Multiply placed.
[a] Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

Level Scheme

Intensities: Relative $I_{(\gamma+ce)}$

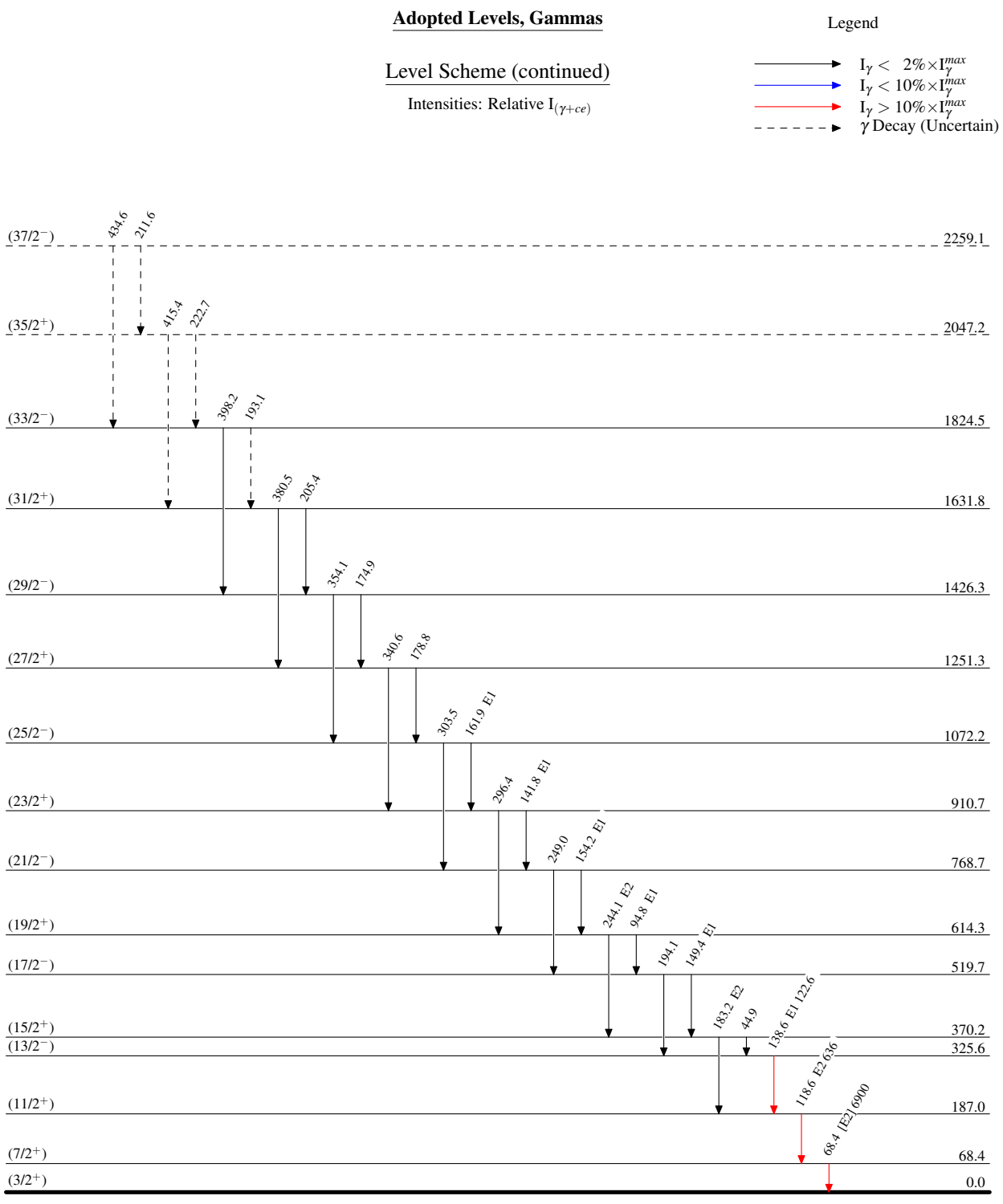


$^{225}_{90}Th_{135}$

Adopted Levels, Gammas

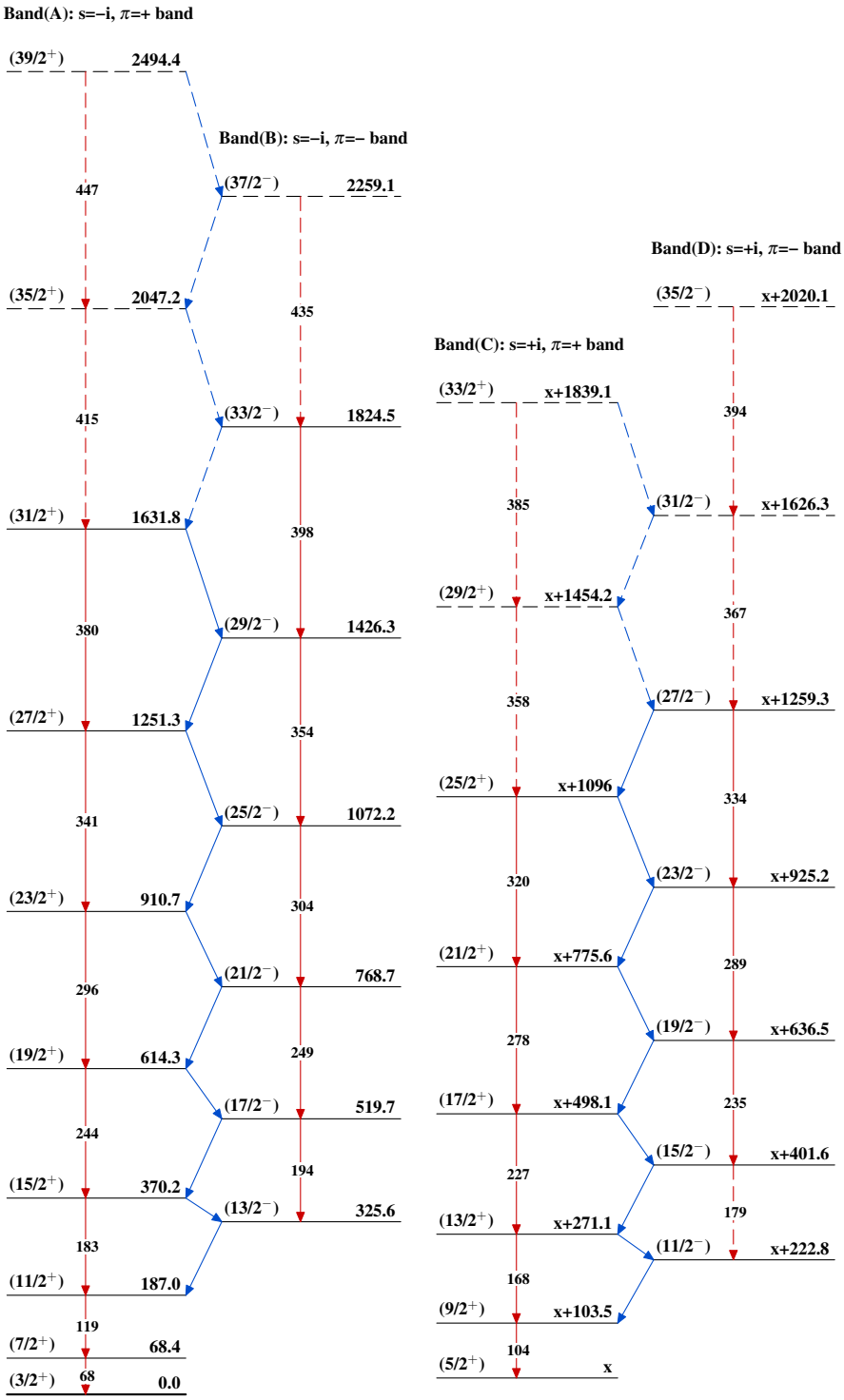
Level Scheme (continued)

Intensities: Relative $I_{(\gamma+ce)}$



$^{225}_{90}Th_{135}$

Adopted Levels, Gammas



$^{225}_{90}Th_{135}$