Adopted Levels, Gammas

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh, Jagdish K. Tuli, and Edgardo Browne	NDS 185, 560 (2022)	31-Aug-2022

Q(β^-)=1947 *13*; S(n)=6147 *21*; S(p)=6042 *17*; Q(α)=3655 *14* 2021Wa16
S(2n)=11070 *18*, S(2p)=14483 *14* (2021Wa16).

1973Ch24: ^{231}Ac produced and identified in ^{232}Th(γ,p), ^{232}Th(n,pn), followed by chemical separation. Measured half-life of 7.5 min from γ decay curves. Confirmation of this activity was made from an observed activity with $T_{1/2}$=7.5 min *2*, by milking four samples of the daughter nucleus ^{231}Th every eight minutes and plotting the initial intensities of the 25.7 keV γ ray. Assignment of this activity to ^{231}Ac was supported by its genetic relationship to ^{231}Th.

A $T_{1/2}$=15 min *1* activity reported by 1960Ta19 from γ rays of 85 keV and 185 keV, and very weak and uncertain γ rays of 280 keV, 390 keV, and 710 keV probably belonged to an impurity such as one of the short-lived tellurium isotopes from disagreement in the half-life value and in the intensity of the 280-keV γ ray, the strongest γ from ^{231}Ac decay, as discussed by 1999Aa03 and 1973Ch24.

Mass measurement: 2012Ch19, 2012Zh46, 2005LiZZ.

Theoretical calculations: consult the NSR database (www.nndc.bnl.gov/nsr/) for five primary references, also listed in this dataset under 'document' records, one for nuclear structure and four for half-lives in radioactive decays. The 'document' records can be accessed through on-line ENSDF database at www.nndc.bnl.gov/ensdf/.

Additional information 1.

^{231}Ac Levels

There is another possible band in ^{231}Ac from ^{232}Th(^{136}Xe,^{137}Csγ) (1999Br17) with cascade of 119.3, 178.6, 234.8, 285.8, 330.4, 368.8, 401.2, (428), (448) keV γ rays. Assignment of this band to ^{231}Ac remains uncertain, as it was not reported in ^{232}Th(^{209}Bi,^{210}Poγ) (2002AbZV,2000JaZY).

Cross Reference (XREF) Flags

- A ^{231}Ra β^- decay (103.9 s)
- B ^{232}Th(t,α)
- C ^{232}Th(^{136}Xe,^{137}Csγ)
- D ^{232}Th(^{209}Bi,^{210}Poγ)

E(level)[†]	J$^\pi$[@]	$T_{1/2}$[a]	XREF	Comments
0.0[b]	1/2$^+$	7.5 min *1*	AB D	%β^-=100 J$^\pi$: probable configuration=π1/2[400] from (t,α) σ data. Also, analogy to β^- decay of ^{227}Fr to ^{227}Ra, as the g.s. decay of ^{231}Ac proceeds through a strong β transition to the 554.5, (1/2)$^-$ level in ^{231}Th, with log *ft*=5.5, and in ^{227}Fr decay to a 675, 1/2$^-$ with log *ft*=5.7. In both cases, this strong β transition is interpreted as 1/2$^+$, π1/2[400], $s_{1/2}$ proton orbit to 1/2$^-$, ν1/2[501], $p_{1/2}$ neutron orbit. $T_{1/2}$: from 1973Ch24, from exponential decay of the strongest γ rays from the decay of ^{231}Ac. Other: ≈7.5 min (1985Hi02, from γ-decay).
5.25 *7*	(1/2$^+$,3/2$^+$,5/2$^+$)		A	J$^\pi$: 232.71γ, (E2(+M1)) from 238, (3/2$^+$) level.
18.35 *8*	(3/2$^-$)		A	Tentative configuration=π1/2[530] (2008Bo29).
37.96[b] *6*	(3/2)$^+$[&]		Ab D	J$^\pi$: 475.3 M1 γ from 1/2$^+$,3/2$^+$.
38[‡c]	(3/2$^-$)[&]		b	
61.70 *7*	(3/2$^+$)		A	Tentative configuration=π3/2[651] (2008Bo29).
68.50? *6*	(5/2$^+$)		A	Tentative configuration=π3/2[651] (2008Bo29).
74.70[b] *6*	(5/2$^+$)		A CD	E(level): 0+x in ^{232}Th(^{136}Xe,^{137}Csγ). Tentative configuration=π1/2[400] (2008Bo29).
76[‡d] *5*	(9/2$^+$)[&]		B	

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Adopted Levels, Gammas (continued)

^{231}Ac Levels (continued)

E(level)[†]	Jπ[@]	$T_{1/2}$[a]	XREF	Comments
94[‡c] *3*	(7/2⁻)[&]		B	
96.07? *5*	(1/2,3/2)		A	Jπ: possible dipole γ to 1/2⁺.
115.97 *6*	(3/2⁻)	14.3 ns *11*	A	Tentative configuration=π3/2[532] (2008Bo29).
135[‡d] *3*	(13/2⁺)[&]		B	
160.63 *7*	(5/2⁻)	<0.90 ns	A	Tentative 5/2⁻ member of configuration=π3/2[532] (2008Bo29).
180.7[#b] *10*	(9/2⁺)[#]		CD	E(level): 106+x in ^{232}Th(^{136}Xe,^{137}Csγ); 74.70+x in ^{232}Th(^{209}Bi,^{210}Poγ).
237.90[e] *6*	(3/2⁺)[&]	57 ps *11*	AB	XREF: B(235).
245.73? *9*	(1/2⁻,3/2⁻,5/2⁻)		A	
257[‡e] *10*	(5/2⁺)[&]		B	
266.68 *6*	(3/2⁻)	90 ps *20*	A	
305[‡] *4*			B	
344.0[#b] *14*	(13/2⁺)[#]		CD	E(level): 269.3+x in ^{232}Th(^{136}Xe,^{137}Csγ); 236.7+x in ^{232}Th(^{209}Bi,^{210}Poγ).
350[‡] *4*			B	
372.28 *7*	1/2⁻,3/2⁻		A	Jπ: 396.9 E1 γ to 1/2⁺ g.s.
415.24 *7*	(3/2⁻,5/2⁻)		AB	XREF: B(420).
449.48 *8*	(3/2⁻,5/2⁻)		A	
456.48? *10*	(3/2⁺,5/2⁺)		A	
471.58 *8*	(5/2⁻)	<54 ps	AB	XREF: B(469). Tentative configuration=π5/2[532] (2008Bo29).
473.24? *11*	(1/2⁻,3/2⁻)		A	
478.17 *10*	1/2⁺,3/2⁺		A	Jπ: 478.1 M1 γ to 1/2⁺ g.s.
485.69 *7*	(3/2⁺,5/2⁺)		A	
498.05 *9*	1/2⁺,3/2⁺		A	Jπ: 498.2 M1 γ to 1/2⁺ g.s.
512.96 *9*	1/2⁺,3/2⁺		A	Jπ: 513.0 M1 γ to 1/2⁺ g.s.
530.93? *9*	(5/2⁺)		A	Tentative configuration=π5/2[642] (2008Bo29).
560.8[#b] *17*	(17/2⁺)[#]		CD	E(level): 486.1+x in ^{232}Th(^{136}Xe,^{137}Csγ); 452.2+x in ^{232}Th(^{209}Bi,^{210}Poγ).
595.14? *16*	(3/2⁻)		A	
647[‡] *10*			B	
670.76? *13*			A	
671[‡] *4*	(11/2⁻)		B	Jπ: possible 11/2⁻ member of π9/2[514] configuration.
680.77 *9*			A	
797[‡] *4*	(5/2⁻)		B	Jπ: possible 5/2⁻ member of π1/2[541] configuration.
824.85? *20*			A	
825.6[#b] *20*	(21/2⁺)[#]		CD	E(level): 750.9+x in ^{232}Th(^{136}Xe,^{137}Csγ); 715.8+x in ^{232}Th(^{209}Bi,^{210}Poγ).
847.2? *3*			A	
848.95 *14*			A	
870.1 *5*			A	
912.1? *6*			A	
931.41? *12*			A	
1021[‡] *7*			B	
1100.24 *20*			AB	XREF: A(?)B(1100).
1114.91? *24*			A	
1126[‡] *6*			B	
1132.6[#b] *22*	(25/2⁺)[#]		CD	E(level): 1057.9+x in ^{232}Th(^{136}Xe,^{137}Csγ); 1022.2+x in ^{232}Th(^{209}Bi,^{210}Poγ).
1137.9 *4*			A	
1155.21? *23*			A	
1248.4? *3*			A	

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Adopted Levels, Gammas (continued)

^{231}Ac Levels (continued)

E(level)[†]	Jπ[@]	XREF	Comments
1288[‡] *5*		B	
1354.2? *5*		A	
1476.4[#b] *25*	(29/2$^+$)[#]	CD	E(level): 1401.7+x in ^{232}Th(^{136}Xe,^{137}Csγ); 1364.1+x in ^{232}Th(^{209}Bi,^{210}Poγ).
1850.4[#b] *26*	(33/2$^+$)[#]	CD	E(level): 1775.7+x in ^{232}Th(^{136}Xe,^{137}Csγ); 1736.8+x in ^{232}Th(^{209}Bi,^{210}Poγ).
2255.4[#b] *28*	(37/2$^+$)[#]	CD	E(level): 2180.7+x in ^{232}Th(^{136}Xe,^{137}Csγ); 2136.7+x in ^{232}Th(^{209}Bi,^{210}Poγ).
2681.4[#b] *30*	(41/2$^+$)[#]	CD	E(level): 2559.1+x in ^{232}Th(^{136}Xe,^{137}Csγ); 2559.1+x in ^{232}Th(^{209}Bi,^{210}Poγ).
3122.0?[#b] *32*	(45/2$^+$)[#]	C	E(level): 2999.7+x in ^{232}Th(^{136}Xe,^{137}Csγ).

† From ^{231}Ra β^- decay, unless otherwise stated.

‡ From (t,α).

From ^{232}Th(^{136}Xe,^{137}Csγ) and/or ^{232}Th(^{209}Bi,^{210}Poγ). J^π from possible band structure in ^{232}Th(^{209}Bi,^{210}Poγ) (2002AbZV).

@ Based on γ-ray multipolarities (2008Bo29) from ce data, and γ-decay pattern. Configurations for some of the levels are proposed by 2008Bo29.

& From comparison of ^{232}Th(t,α) cross sections (1977Th04) with calculated values for band members, 'finger-print' method, combined with systematics of level structures in ^{229}Ac, ^{233}Pa, ^{235}Pa, ^{237}Pa in 1977Th04. Evaluators consider the assignment as tentative, as strong arguments seem lacking.

a For excited states, values are from βγγ(t) fast-timing technique (2008Bo29,2007Bo48).

b Band(A): π1/2[400].

c Band(B): π1/2[530].

d Band(C): π3/2[651].

e Band(D): π3/2[402].

Adopted Levels, Gammas (continued)

γ(^{231}Ac)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	δ[‡]	α[#]	Comments
18.35	(3/2⁻)	18.44 *10*	100	0.0	1/2⁺	[E1]		6.29 *13*	
37.96	(3/2)⁺	19.64 *10*	≈100	18.35	(3/2⁻)	[E1]		5.29 *11*	
		37.8 *4*	15 *5*	0.0	1/2⁺	[M1]		59.1 *21*	
61.70	(3/2⁺)	56.50 *5*	100	5.25	(1/2⁺,3/2⁺,5/2⁺)	E2(+M1)	>2.0	143 *14*	
68.50?	(5/2⁺)	63.23[a] *5*	100	5.25	(1/2⁺,3/2⁺,5/2⁺)	[M1,E2]		52 *40*	
74.70	(5/2⁺)	36.74 *5*	100	37.96	(3/2)⁺	[M1]		64.3 *9*	
96.07?	(1/2,3/2)	96.01[a] *6*	100	0.0	1/2⁺	[D]		2.0 *19*	
115.97	(3/2⁻)	41.27 *5*	9.7 *19*	74.70	(5/2⁺)	[E1]		1.197 *17*	B(E1)(W.u.)=7.5×10^{-6} *+17−15*
		47.45 *5*	3.8 *5*	68.50?	(5/2⁺)	[E1]		0.826 *12*	B(E1)(W.u.)=1.93×10^{-6} *+36−31*
		54.29 *5*	100 *11*	61.70	(3/2⁺)	E1		0.577 *8*	B(E1)(W.u.)=3.39×10^{-5} *31*
		77.97 *6*	37.8 *44*	37.96	(3/2)⁺	E1		0.220 *3*	B(E1)(W.u.)=4.3×10^{-6} *+7−6*
160.63	(5/2⁻)	44.6 *1*	100	115.97	(3/2⁻)	M1		36.3 *5*	B(M1)(W.u.)>0.0072
180.7	(9/2⁺)	106[a]		74.70	(5/2⁺)				E_γ: from ^{232}Th(^{136}Xe,^{137}Csγ) (1999Br17), also expected from rotational-energy analysis.
237.90	(3/2⁺)	77.17 *7*	6.3 *13*	160.63	(5/2⁻)	E1		0.226 *3*	B(E1)(W.u.)=1.8×10^{-4} *+6−5*
		121.96 *8*	11.7 *13*	115.97	(3/2⁻)	[E1]		0.302 *4*	B(E1)(W.u.)=8.2×10^{-5} *+22−19*
		141.88[a] *10*	≤7.5	96.07?	(1/2,3/2)	[D]		3.3 *31*	
		219.69 *15*	38 *5*	18.35	(3/2⁻)	[E1]		0.074 *1*	B(E1)(W.u.)=4.6×10^{-5} *+12−11*
		232.71 *9*	100 *9*	5.25	(1/2⁺,3/2⁺,5/2⁺)	(E2(+M1))	>4	0.40 *4*	B(M1)(W.u.)=7.3×10^{-4} *+35−73*; B(E2)(W.u.)=66 *+37−23*
		237.86 *15*	10.9 *13*	0.0	1/2⁺	[M1]		1.47 *2*	B(M1)(W.u.)=0.00127 *+33−30*
245.73?	(1/2⁻,3/2⁻,5/2⁻)	129.76 *7*	100	115.97	(3/2⁻)	M1+E2		5.8 *24*	
266.68	(3/2⁻)	21.0[a] *4*	<0.01	245.73?	(1/2⁻,3/2⁻,5/2⁻)	[M1]		3.3×10^2 *22*	B(M1)(W.u.)=4×10^{-4} *+8−4*
		106.48[a] *9*	8.0 *13*	160.63	(5/2⁻)	[M1]		2.86 *4*	B(M1)(W.u.)=0.0044 *+15−10*; E_γ: somewhat poor fit, level-energy difference=106.05.
		150.75 *10*	1.29 *16*	115.97	(3/2⁻)	[M1]		5.30 *8*	B(M1)(W.u.)=2.5×10^{-4} *+8−6*
		170.41[a] *10*	2.25 *32*	96.07?	(1/2,3/2)	[D]		1.9 *18*	
		192.00 *8*	24.6 *27*	74.70	(5/2⁺)	[E1]		0.1017 *14*	B(E1)(W.u.)=1.9×10^{-5} *+6−4*
		198.18 *8*	100 *10*	68.50?	(5/2⁺)	E1		0.0943 *13*	B(E1)(W.u.)=7.0×10^{-5} *+22−14*
		205.00 *10*	117 *26*	61.70	(3/2⁺)	E1		0.0871 *12*	B(E1)(W.u.)=7.4×10^{-5} *+23−18*
		228.73 *10*	28.1 *27*	37.96	(3/2)⁺	[E1]		0.0673 *10*	B(E1)(W.u.)=1.28×10^{-5} *+41−27*
		260.82 *10*	25.4 *24*	5.25	(1/2⁺,3/2⁺,5/2⁺)	[E1]		0.0497 *7*	B(E1)(W.u.)=7.8×10^{-6} *+25−16*; E_γ: poor fit, level-energy difference=261.43.
344.0	(13/2⁺)	163.3		180.7	(9/2⁺)				E_γ: from (^{136}Xe,^{137}Cs). Other: 162.0 in (^{209}Bi,^{210}Po).
372.28	1/2⁻,3/2⁻	134.38[a] *10*	2.0 *5*	237.90	(3/2⁺)	[E1]		0.239 *4*	
		372.27 *10*	100 *10*	0.0	1/2⁺	E1		0.0225 *3*	
415.24	(3/2⁻,5/2⁻)	177.39 *8*	11.5 *18*	237.90	(3/2⁺)	[E1]		0.1228 *17*	
		254.57 *10*	100 *10*	160.63	(5/2⁻)	M1		1.217 *17*	

$^{231}_{89}Ac_{142}$-4

Adopted Levels, Gammas (continued)

γ(^{231}Ac) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	δ[‡]	α[#]	Comments
415.24	(3/2⁻,5/2⁻)	299.10 *15*	40 *4*	115.97	(3/2⁻)	M1		0.780 *11*	
		396.92[@] *15*	35 *11*	18.35	(3/2⁻)	M1		0.360 *5*	2008Bo29 placed 396.92γ from the 415 level only in Tables 1 and 2, but in Fig. 1 and Table 4, placement was also shown from 471 level. The latter placement appears incorrect, as implied multipolarity of E1 for this placement is inconsistent with M1 from α(K) exp data in authors′ Table 2. However, possibility of a small component of the 396.9 γ ray from the 471.6 level is not precluded. Evaluators assign the intensity given in 2008Bo29 to the placement from 415 level only.
449.48	(3/2⁻,5/2⁻)	211.50[&] *10*	43[&] *13*	237.90	(3/2⁺)	[E1]		0.0809 *11*	
		288.94 *10*	100 *13*	160.63	(5/2⁻)	M1		0.857 *12*	
456.48?	(3/2⁺,5/2⁺)	295.74 *15*	15 *4*	160.63	(5/2⁻)	[E1]		0.0370 *5*	
		381.76[a] *15*	24 *4*	74.70	(5/2⁺)	[M1]		0.400 *6*	
		387.99[a] *15*	35 *9*	68.50?	(5/2⁺)	[M1]		0.383 *5*	
		394.90 *15*	100 *10*	61.70	(3/2⁺)	M1		0.365 *5*	
471.58	(5/2⁻)	204.79 *10*	44 *15*	266.68	(3/2⁻)	M1		2.23 *3*	B(M1)(W.u.)>0.0056
		355.66 *20*	3.7 *7*	115.97	(3/2⁻)	M1		0.485 *7*	B(M1)(W.u.)>8.0×10^{-5}
		396.92[@a] *15*		74.70	(5/2⁺)				
		403.03 *15*	27.9 *27*	68.50?	(5/2⁺)	[E1]		0.0190 *3*	B(E1)(W.u.)>3.8×10^{-6}
		409.89 *10*	100 *9*	61.70	(3/2⁺)	E1		0.0184 *3*	B(E1)(W.u.)>1.4×10^{-5}
473.24?	(1/2⁻,3/2⁻)	357.26 *10*	100 *9*	115.97	(3/2⁻)	M1		0.479 *7*	
		473.40[a] *30*	14.5 *31*	0.0	1/2⁺	[E1]		0.0136 *2*	
478.17	1/2⁺,3/2⁺	211.50[&] *10*	6.8[&] *27*	266.68	(3/2⁻)	[E1]		0.0809 *12*	
		478.15 *15*	100 *14*	0.0	1/2⁺	M1		0.218 *3*	
485.69	(3/2⁺,5/2⁺)	70.44 *5*	6.4 *8*	415.24	(3/2⁻,5/2⁻)	[E1]		0.288 *4*	
		113.40 *8*	8.8 *8*	372.28	1/2⁻,3/2⁻	[E1]		0.358 *5*	
		247.65 *15*	100 *10*	237.90	(3/2⁺)	M1(+E2)	<0.8	0.9 *4*	
		325.12 *15*	20.0 *24*	160.63	(5/2⁻)				
		369.52 *30*	118 *21*	115.97	(3/2⁻)				
		417.55[a] *10*	11.2 *16*	68.50?	(5/2⁺)	[M1]		0.314 *5*	E_γ: somewhat poor fit, level-energy difference=417.19.
		467.39 *15*	109 *16*	18.35	(3/2⁻)				
498.05	1/2⁺,3/2⁺	26.40 *8*	>4.0	471.58	(5/2⁻)	[E1]		3.90 *7*	
		429.62 *15*	48 *6*	68.50?	(5/2⁺)	[M1]		0.290 *4*	
		498.20 *15*	100 *9*	0.0	1/2⁺	M1		0.195 *3*	
512.96	1/2⁺,3/2⁺	444.32[a] *10*	4.9 *9*	68.50?	(5/2⁺)	[M1]		0.265 *4*	
		475.29 *15*	49 *5*	37.96	(3/2)⁺	M1		0.221 *3*	
		494.57 *30*	4.3 *9*	18.35	(3/2⁻)				
		513.00 *15*	100 *13*	0.0	1/2⁺	M1		0.180 *3*	
530.93?	(5/2⁺)	81.48 *9*	6.7 *9*	449.48	(3/2⁻,5/2⁻)	[E1]		0.196 *3*	
		456.19 *15*	74 *7*	74.70	(5/2⁺)	M1		0.247 *4*	

$^{231}_{89}Ac_{142}$-5

Adopted Levels, Gammas (continued)

γ(^{231}Ac) (continued)

E_i(level)	J_i^π	E_γ [†]	I_γ [†]	E_f	J_f^π	Mult.[‡]	α[#]	Comments
530.93?	(5/2$^+$)	462.38 *15*	59 *5*	68.50?	(5/2$^+$)	M1	0.238 *3*	
		469.23 *15*	100 *9*	61.70	(3/2$^+$)	M1	0.229 *3*	
560.8	(17/2$^+$)	216.8		344.0	(13/2$^+$)			E_γ: from (^{136}Xe,^{137}Cs). Other: 215.5 in (^{209}Bi,^{210}Po).
595.14?	(3/2$^-$)	434.50 *15*	100 *9*	160.63	(5/2$^-$)	M1	0.282 *4*	
		595.3 *5*	36 *5*	0.0	1/2$^+$			
670.76?		425.02 *10*	100 *22*	245.73?	(1/2$^-$,3/2$^-$,5/2$^-$)			
		609.3[a] *5*	122 *13*	61.70	(3/2$^+$)			
680.77		195.09 *10*	100 *11*	485.69	(3/2$^+$,5/2$^+$)			
		442.90 *10*	53 *7*	237.90	(3/2$^+$)			
		612.5[a] *5*	12.3 *12*	68.50?	(5/2$^+$)			
		662.0 *3*	64 *6*	18.35	(3/2$^-$)			
824.85?		586.8 *6*	67 *13*	237.90	(3/2$^+$)			
		763.1 *3*	100 *27*	61.70	(3/2$^+$)			
825.6	(21/2$^+$)	264.8		560.8	(17/2$^+$)			E_γ: from (^{136}Xe,^{137}Cs). Other: 263.6 in (^{209}Bi,^{210}Po).
847.2?		432.00[a] *30*	200 *28*	415.24	(3/2$^-$,5/2$^-$)			
		842.0 *5*	100 *33*	5.25	(1/2$^+$,3/2$^+$,5/2$^+$)			
848.95		375.72[a] *10*	85 *11*	473.24?	(1/2$^-$,3/2$^-$)			
		732.6 *5*	100 *30*	115.97	(3/2$^-$)			
		849.1 *5*	16 *6*	0.0	1/2$^+$			
870.1		754.1 *5*	100	115.97	(3/2$^-$)			
912.1?		381.16[a] *30*	7.3 *7*	530.93?	(5/2$^+$)			
		912.1 *6*	100 *17*	0.0	1/2$^+$			
931.41?		445.74 *10*	100 *13*	485.69	(3/2$^+$,5/2$^+$)			
		481.74[a] *30*	52 *11*	449.48	(3/2$^-$,5/2$^-$)			
1100.24		275.38 *10*	31 *12*	824.85?				
		569.4 *5*	100 *14*	530.93?	(5/2$^+$)			
		614.6[a] *3*	29 *4*	485.69	(3/2$^+$,5/2$^+$)			
1114.91?		1040.2 *5*	100 *10*	74.70	(5/2$^+$)			
		1046.2[a] *5*	38 *4*	68.50?	(5/2$^+$)			
1132.6	(25/2$^+$)	307.0		825.6	(21/2$^+$)			E_γ: from (^{136}Xe,^{137}Cs). Other: 306.4 in (^{209}Bi,^{210}Po).
1137.9		666.3[a] *4*	28 *5*	471.58	(5/2$^-$)			
		871.1 *6*	100 *10*	266.68	(3/2$^-$)			
1155.21?		40.30[a] *5*	18 *8*	1114.91?		[D]	25 *24*	
		1086.3[a] *6*	60 *8*	68.50?	(5/2$^+$)			
		1150.1[a] *4*	78 *10*	5.25	(1/2$^+$,3/2$^+$,5/2$^+$)			
		1155.6[a] *6*	100 *30*	0.0	1/2$^+$			
1248.4?		577.7[a] *3*	100 *32*	670.76?				
		1248.3[a] *5*	37 *11*	0.0	1/2$^+$			
1354.2?		868.4[a] *6*	100 *16*	485.69	(3/2$^+$,5/2$^+$)			
		1354.4[a] *9*	14 *3*	0.0	1/2$^+$			
1476.4	(29/2$^+$)	343.8		1132.6	(25/2$^+$)			E_γ: from (^{136}Xe,^{137}Cs). Other: 341.9 in (^{209}Bi,^{210}Po).
1850.4	(33/2$^+$)	374		1476.4	(29/2$^+$)			E_γ: from (^{136}Xe,^{137}Cs). Other: 372.7 in (^{209}Bi,^{210}Po).

$^{231}_{89}Ac_{142}$-6

Adopted Levels, Gammas (continued)

$\gamma(^{231}Ac)$ (continued)

E_i(level)	J_i^π	E_γ [†]	E_f	J_f^π	Comments
2255.4	$(37/2^+)$	405	1850.4	$(33/2^+)$	E_γ: from (^{136}Xe,^{137}Cs). Other: 399.9 in (^{209}Bi,^{210}Po).
2681.4	$(41/2^+)$	426	2255.4	$(37/2^+)$	E_γ: from (^{136}Xe,^{137}Cs). Other: 422.4 in (^{209}Bi,^{210}Po).
3122.0?	$(45/2^+)$	440.6[a]	2681.4	$(41/2^+)$	E_γ: 440.6 from (^{209}Bi,^{210}Po) only. As values in (^{209}Bi,^{210}Po) (2002AbZV) are consistently lower as compared to those in (^{136}Xe,^{137}Cs) (1999Br17), the given Eγ may be lower by ≈4 keV.

† From ^{231}Ra β^- decay.
‡ From ce data in ^{231}Ra β^- decay.
# 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.
@ Multiply placed.
& Multiply placed with intensity suitably divided.
[a] Placement of transition in the level scheme is uncertain.

$^{231}_{89}Ac_{142}$-7

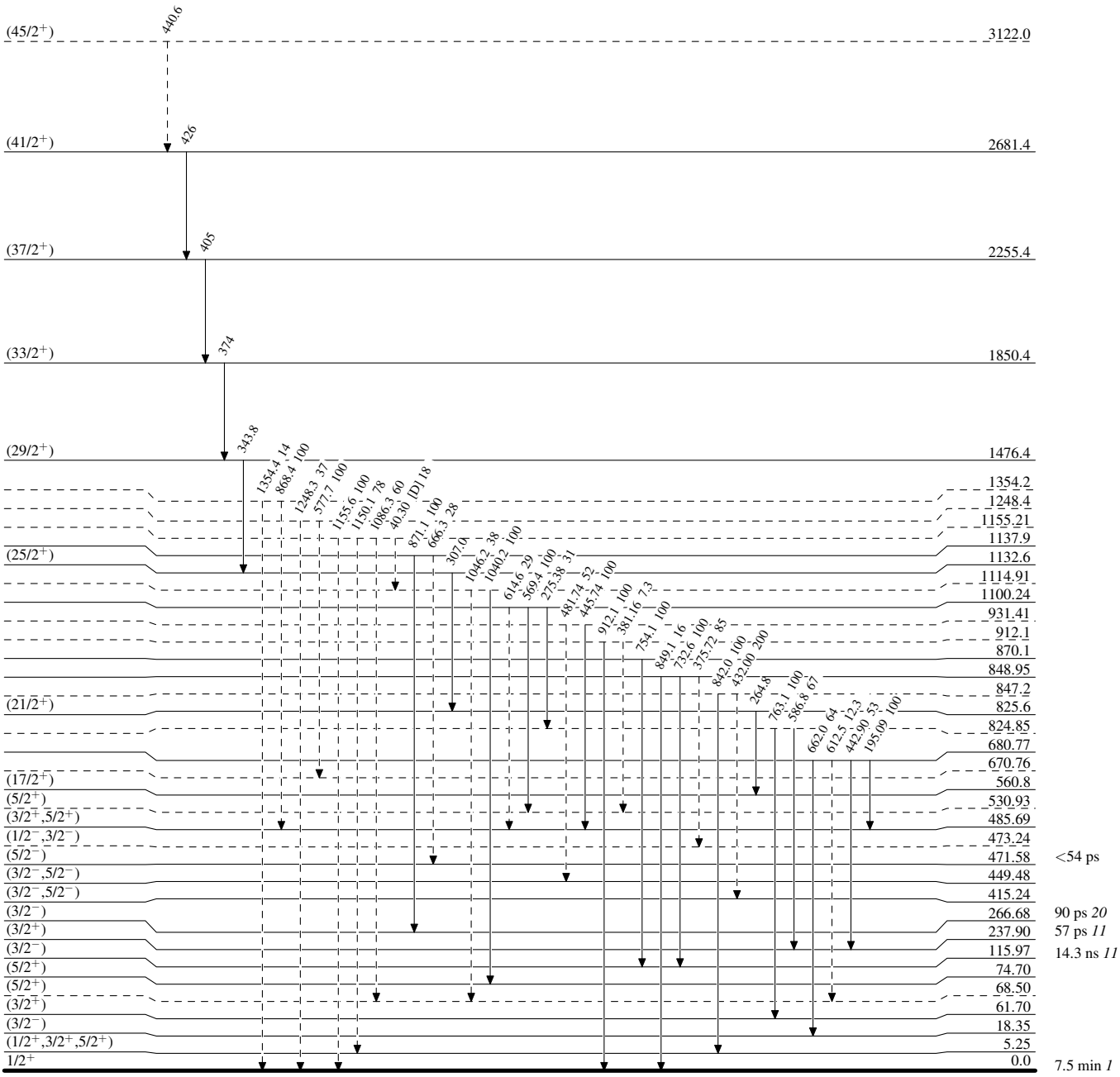
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{231}_{89}Ac_{142}$

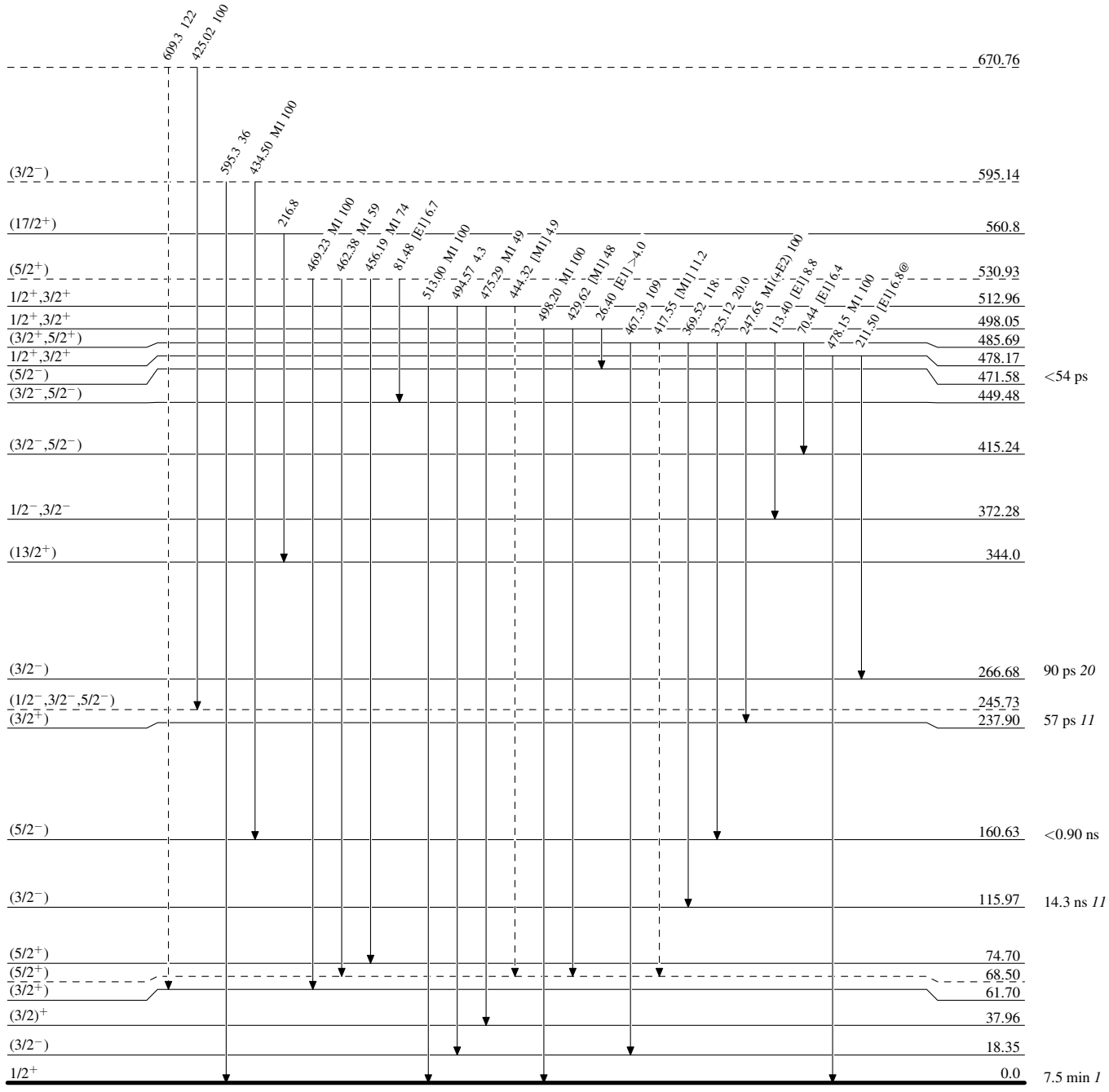
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level
@ Multiply placed: intensity suitably divided

γ Decay (Uncertain)



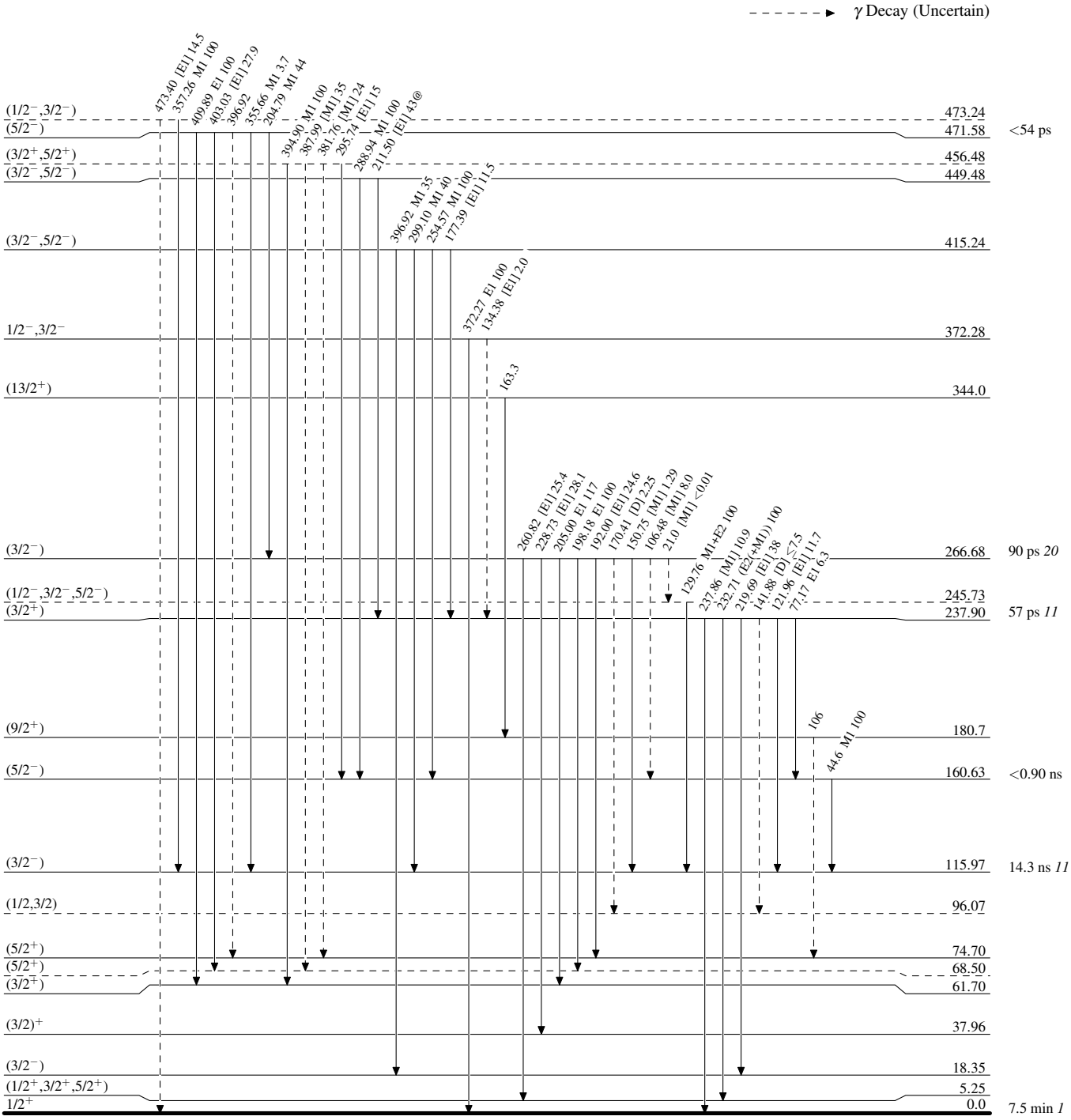
$^{231}_{89}Ac_{142}$

Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level
@ Multiply placed: intensity suitably divided



$^{231}_{89}Ac_{142}$

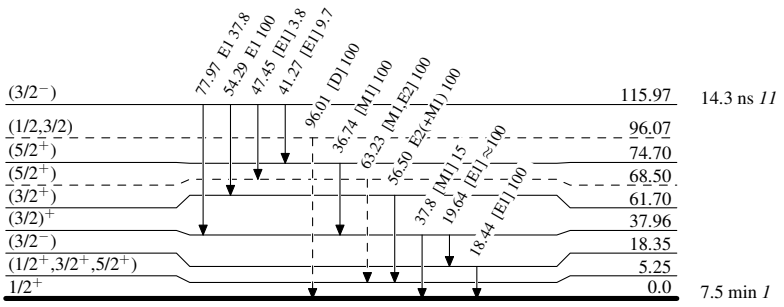
Adopted Levels, Gammas

Legend

Level Scheme (continued)

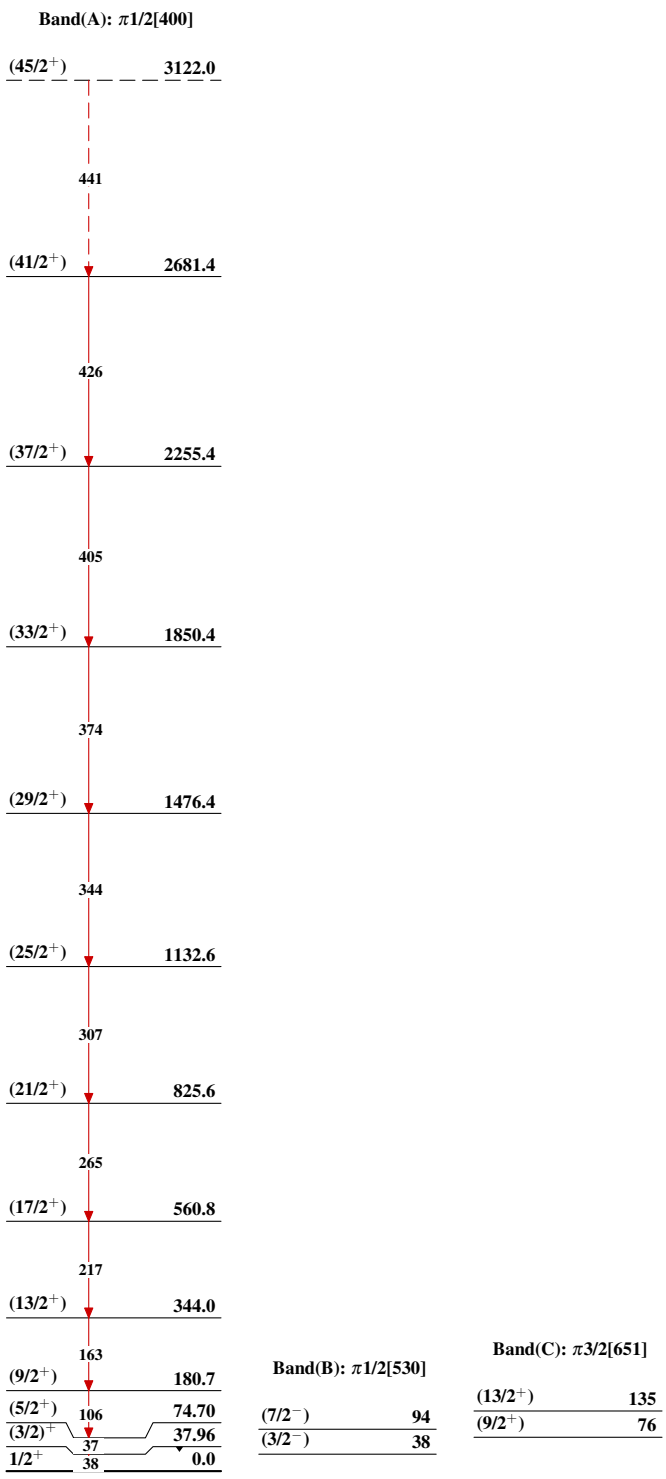
Intensities: Relative photon branching from each level
@ Multiply placed: intensity suitably divided

- - - - - - ► γ Decay (Uncertain)



$^{231}_{89}Ac_{142}$

Adopted Levels, Gammas



$^{231}_{89}Ac_{142}$

Adopted Levels, Gammas (continued)

Band(D): π3/2[402]

($5/2^+$) 257

($3/2^+$) 237.90

$^{231}_{89}Ac_{142}$