Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	M. S. Basunia	NDS 107,2323 (2006)	15-Mar-2006

Q(β^-)=−220.0 *13*; S(n)=6.58×10^3 *5*; S(p)=4862.02 *23*; Q(α)=4958.5 *11* 2012Wa38
Note: Current evaluation has used the following Q record −220.0 13 *6580* 50 *4862*.0223 *4958*.3 *12* 2003Au03.
Energies and structures of various states were calculated in 1971Ga20. See also 1976Ch22 and 1972Be91 for calculated energies.
Quadrupole and hexadecapole deformations were calculated from single-particle energies in 1976Ch22.

^{237}Np Levels

Cross Reference (XREF) Flags

A	^{241}Am α decay	F	^{237}Np(d,d′)
B	^{237}U β^- decay	G	^{238}U(p,2nγ)
C	^{237}Pu ε decay	H	^{237}Np(γ,X),(e,X),(μ,X)
D	Coulomb excitation	I	^{237}Np(^{209}Bi,γ)
E	^{236}U(^{3}He,d), ^{236}U(α,t)		

E(level)[†]	J$^\pi$[‡]	T$_{1/2}$	XREF	Comments
0.0[@]	5/2$^+$[#]	2.144×10^6 y *7*	ABCD FG I	%α=100; %SF≤2×10^{-10} μ=+3.14 *4*; Q=+3.886 *6* (1989Ra17) J$^\pi$: spin measured (see 1976Fu06, 1989Ra17 for references). Orbital assignment from J and μ. See 1972El21, 1976Ch22 and 1982Li02 for calculated μ values. T$_{1/2}$: From 1992Lo03 (specific activity). Earlier measurements: 2.20×10^6 y *11* (1949Ma01), 2.14×10^6 y *1* (1960Br12). T$_{1/2}$(SF)≥1.×10^{18} y (1961Dr04). 1988Io05 and 1992Gr16 calculate T$_{1/2}$(SF) to be about 10^{18} y and 10^{14} y, respectively. Decay by pion emission was also studied and branching relative to spontaneous fission was calculated in 1988Io05. From nonobservation of any cluster decays, 1992Mo03 deduced that branching for (^{30}Mg or ^{32}Si) decay/branching for α decay<1.8×10^{-14}. Similarly, 1985TrZY obtained (%cluster decay/%alpha decay)<8×10^{-14}. Decays by heavy particle emissions have been studied and partial half-lives have been calculated by various groups by using various models. See, for example, 1984Po08, 1985Po12, 1985Pr01, 1986Ir01, 1986Po15, 1987Po08, 1987Sh04, 1988Bl11, 1988Iv02, 1989Bu06, 1989Si13, 1989Ma43, 1989Sh37, 1989Si13, 1990Ba20, 1990Bu09, 1990Sh01, 1992Gu10, 1993Go18 and 1993Gr15.
33.19629[&] *22*	7/2$^+$	54 ps *24*	ABCDEFG I	J$^\pi$: 33.196γ M1+E2 to 5/2$^+$ state; Coulomb excitation. T$_{1/2}$: From Coulomb exitation using B(E2)=3.1 *8* and adopted γ-properties.
59.54092[a] *10*	5/2$^-$[#]	67.2 ns *7*	ABC G I	μ=+1.68 *3*; Q=+3.85 *4* (1989Ra17) See 1972El21, 1982Li02 for calculated μ values. J$^\pi$: favored α decay from ^{241}Am. T$_{1/2}$: From $\alpha\gamma$(t) in ^{241}Am α decay. T$_{1/2}$=63 ns *5* was measured in ^{237}U β^- decay.
75.899[@] *5*	9/2$^+$[#]	≈28 ps	ABCDEFG I	T$_{1/2}$: From Coulomb exitation.
102.959[b] *3*	7/2$^-$[#]	80 ps *40*	ABC EFG I	J$^\pi$: 43.423γ M1+E2 to 5/2$^-$ state; α hindrance factor; intensities of 69.76γ (E1) and 102.98γ E1 transitions to the 7/2$^+$ and 5/2$^+$ states, respectively.

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Adopted Levels, Gammas (continued)

^{237}Np Levels (continued)

E(level)†	Jπ‡	$T_{1/2}$	XREF	Comments
				$T_{1/2}$: From Doppler shift of ce(L3) 43.4γ (1965Wo02).
129.99& 3	11/2+		A DEFG I	
158.497a 11	9/2−#		A C EFG I	Jπ: 55.56γ M1+E2 to 7/2− state, 98.97γ E2 to 5/2− state; α hindrance factor.
191.53@ 6	13/2+#		A DEFG I	
225.957b 16	11/2−#		A FG I	Jπ: 123.01γ E2 to 7/2− state, 67.45γ (M1+E2) to 9/2− state; energy fit to the rotational band.
267.556c 12	3/2−	5.2 ns 2	AB e	Jπ: 164.6γ E2 to 7/2− state; log *ft*=6.53 for the β− feeding from 1/2+ ^{237}U parent.
				$T_{1/2}$: From βγ(t) (see ^{237}U β− decay).
268.80& 16	15/2+		D FG I	
281.356c 18	1/2−		AB e	Jπ: 13.81γ M1+E2 to 3/2− state, 221.80γ E2 to 5/2− state. Local trend of the 1/2[530] orbital and nonobservation of direct α feeding are consistent with the assignment.
305.05a 3	13/2−#		A G I	Jπ: 146.55γ E2 to 9/2−; energy fit to the band.
316.80? 20			A	
324.420c 23	(7/2−)		A EF	Jπ: gammas to 9/2+, 9/2−, 5/2− levels; (α,t), (^{3}He,d) data.
332.376d 16	1/2+	≤1.0 ns	AB	Jπ: 51.01γ and 64.83γ to 1/2− and 3/2− state are E1, 332.36γ E2 to 5/2+ state.
				$T_{1/2}$: From βγ(t) in ^{237}U β− decay (1960Un01).
347.62@ 18	17/2+#		DEF I	
359.7c 1	(5/2−)		A E	XREF: E(365). Jπ: energy fit to the rotational band.
368.602d 20	5/2+		AB	Jπ: 335.37γ and 368.65γ to 7/2+ and 5/2+ states are M1+E2; intensities of γ′s to the 5/2[642] band and the α hindrance factor are consistent with the assignment.
370.928d 23	3/2+		AB	Jπ: 370.94γ M1+E2 to 5/2+ state; log *ft*≈7.5 for the β− feeding from 1/2+ ^{237}U parent.
395.53b 4	15/2−#		A I	Jπ: 169.56γ to 11/2− is E2; energy fit to the band.
418.2? 1			A	
434.12c 5	(11/2−)		A E	Jπ: gammas to 7/2−, 13/2− levels; (^{3}He,d), (α,t) data; energy fit to the rotational band.
444.78? 10			A	
452.52& 20	19/2+		D I	
452.545d 22	9/2+		A F	Jπ: gammas to 5/2+ and 13/2+ states. Band member.
459.693d 24	7/2+		A E	XREF: E(466). Jπ: intensities of gammas to 5/2+, 7/2+, 9/2+ states; energy fit to the band.
486.21c 9	(9/2−)		A E	Jπ: gammas to (7/2−), 11/2− states; energy fit to the rotational band; (^{3}He,d) reaction data.
497.01a 5	17/2−#		A I	Jπ: γ to the 13/2− member of the band; energy fit to the rotational band.
514.19e 4	(3/2−)#		A EF	Jπ: gammas to the 1/2−, 3/2−, 5/2−, 5/2+ levels; (^{3}He,d) and (d,d′) reaction data.
544.80@ 23	21/2+#		D I	
546.12e 6	(5/2−)#		A EF	Jπ: gammas to the 5/2+, 7/2+, 3/2−, and 1/2− states; (^{3}He,d), (α,t), and (d,d′) data.
590.09e 4	(7/2−)#		A EF	Jπ: (^{3}He,d), (α,t) and (d,d′) data.
592.33d 7	13/2+		A	Uncertainty of the level energy is increased because of poor least-square fit of γ energies. Jπ: gammas to the 9/2+, 11/2+, 13/2+, and 15/2− states; level energy fit to the band.

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Adopted Levels, Gammas (continued)

^{237}Np Levels (continued)

E(level)[†]	Jπ[‡]	$T_{1/2}$	XREF	Comments
597.99[d] 9	11/2+		A	Jπ: gammas to the 7/2+, 9/2+, 11/2+, and 13/2+ states; level energy fit to the band.
609.3[b] 3	19/2−[#]		I	Jπ: Band member.
618 2			F	
646.03[e] 17	(9/2−)[#]		A F	Jπ: (d,d′) data; gammas to the 5/2−, 9/2− states; level energy fit to the band.
666.19 10	(5/2+,7/2−)		A F	Jπ: gammas to 5/2+, 7/2+, 9/2+ and probably 3/2− states.
681.63[&] 24	23/2+		D I	
709[e] 3	(11/2−)[#]		EF	Jπ: (d,d′),(α,t) and (^{3}He,d) data; fit to band.
721.961[f] 13	5/2−		A F	Jπ: 662.42γ E0+E2+M1 to 5/2− state.
731.7[a] 4	21/2−[#]		I	Jπ: Band member.
755.685[f] 19	7/2−		A F	Jπ: γ's to 5/2−,7/2−,9/2−,5/2+,7/2+ levels; α hindrance factor; (d,d′) data.
758 6			E	
770.57 5			A F	
784.1[@] 3	25/2+[#]		D I	
799.82[f] 4	9/2−		A F	Jπ: (d,d′) data; gammas to 7/2, 11/2 states; energy fit to the rotational band; α hindrance factor.
805.77 12	(7/2+,9/2+)		A	Jπ: gammas to the 5/2+ − 11/2+ states of g.s. band.
823 3			F	
853.36[f] 15	11/2−		A F	Jπ: (d,d′) data; energy fit to the rotational band.
861.65 19	(5/2+,7/2)		A F	Jπ: γ's to 5/2+, 5/2− and possibly 9/2+ states.
863.0[b] 4	23/2−[#]		I	
906 2			F	
914 4			E	
920.88 20			A F	
945.20 10	11/2,13/2	0.71 μs 4	G	%IT=100 Jπ: γ's to 9/2−, 15/2+ levels. $T_{1/2}$: From ^{238}U(p,2nγ) in 1990St29. See ^{238}U(p,2nγ) section for the configurations proposed in 1990St29.
946 2			F	
955.9[&] 3	27/2+		D I	
961 3			E	
963 2			F	
984 2			F	
1004.9[a] 4	25/2−[#]		I	
1013 3			F	
1020 3			E	
1030 3			F	
1040 4			EF	XREF: E(1046).
1064.6[@] 3	29/2+[#]		D I	
1066 3			F	
1072 6			E	
1112 4			E	
1137?			E	
1151.3[b] 5	27/2−[#]		I	
1274.4[&] 3	31/2+		D I	
1312.7[a] 5	29/2−[#]		I	
1384.3[@] 4	33/2+[#]		D I	
1473.7[b] 6	31/2−[#]		I	
1634.2[&] 5	35/2+		D I	

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Adopted Levels, Gammas (continued)

^{237}Np Levels (continued)

E(level)†	Jπ‡	$T_{1/2}$	XREF		Comments
1653.4[a] *6*	33/2−[#]			I	
1743.8[@] *4*	37/2+[#]		D	I	
1824.5[b] *7*	35/2−[#]			I	
2024.0[a] *7*	37/2−[#]			I	
2034.8[&] *5*	39/2+		D	I	
2139.9[@] *5*	41/2+[#]		D	I	
2200.9[b] *9*	39/2−[#]			I	
2422.9[a] *9*	41/2−[#]			I	
2473.4[&] *6*	43/2+		D	I	
2571.4[@] *6*	45/2+[#]		D	I	
2601.9[b] *10*	43/2−[#]			I	
2.8×10^3 *4*		45 ns *5*			%SF≤100 Only SF decay observed. %SF/(%SF+%IT)=1.9×10^{-3} was deduced in 1977Mi09 and 6.9×10^{-4} in 1973Wo03 from analyses of delay-to-prompt fission cross-section ratios. E(level): 2700 *300* and 2850 *400* were deduced in 1973Wo03 and 1977Mi09, respectively, from the delayed-to-prompt fission ratios in ^{238}U(p,2n) reactions by using an evaporation model and the statistical model calculations. $T_{1/2}$: 40 ns *12* (1973Wo03), 45 ns *5* (1977Mi09). See 1972We09, for example, for calculations of E(level), $T_{1/2}$(SF) and $T_{1/2}(\gamma)$. For calculated fission-barrier parameters, see 1972We09, 1974Ba73, 1976Ga11, 1980Ku14, 1981Re06, 1984Ku05, 1990Bh02, 1993Oh03, for example.
2848.8[a] *10*	45/2−[#]			I	
2947.7[&] *7*	47/2+		D	I	
3028.6[b] *11*	47/2−[#]			I	
3036.1[@] *8*	49/2+[#]		D	I	
3301.2[a] *11*	49/2−[#]			I	
3455.7[&] *8*	51/2+		D	I	
3481.4[b] *12*	51/2−[#]			I	
3532.6[@] *10*	53/2+[#]		D	I	
3780.1[a] *13*	53/2−[#]			I	
3961.6[b] *13*	55/2−[#]			I	
3994.4[&] *10*	55/2+		D	I	
4059.2[@] *11*	57/2+[#]		D	I	
4287.8[a]	(57/2−)[#]			I	
4469.6[b]	(59/2−)[#]			I	
4564.5[&] *11*	59/2+			I	
4614.6[@] *12*	61/2+[#]			I	

† From a least squares fit to the adopted γ-ray energies.

‡ The assignments are based on rotational band structure; comparison of experimental spectroscopic factors with theory in (^{3}He,d) and (α,t); and the relative cross sections in (d,d′) studies. Additional arguments in the comment section.

Assignments for 9/2+<J^π>59/2+ are also based on Coulomb excitation, intraband transitions, and fit to the band, except J^π 59/2+

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Adopted Levels, Gammas (continued)

^{237}Np Levels (continued)

and J^{π} $61/2^{+}$.

@ Band(A): 5/2[642] band: α=+1/2 Small rotational band parameter of A=4.7 indicate that this band is probably mixed with the 7/2[633] and 3/2[651] bands.

& Band(B): 5/2[642] band: α=−1/2 Small rotational band parameter of A=4.7 indicate that this band is probably mixed with the 7/2[633] and 3/2[651] bands.

[a] Band(C): 5/2[523] band: α=+1/2.

[b] Band(D): 5/2[523] band: α=−1/2.

[c] Band(E): 1/2[530] band.

[d] Band(F): 1/2[400] band.

[e] Band(G): 3/2[521] band.

[f] Band(H): $K^{\pi}=5/2^{-}$ band Low hindrance factor for the α transitions from ^{241}Am and strong E0+E2+M1 (662γ) from $5/2^{-}$ state to $5/2^{-}$[523] state, 653γ from $7/2^{-}$ to $7/2^{-}$,5/2[523] state suggest that this is a β-vibrational band built on 5/2[523] state. However, levels are also seen in (d,d′) reaction where β-vibrational band is not expected to be populated strongly. The relative cross sections indicate that the levels are populated in L=3 transfer. It is suggested in 1976Th01 that an octupole ($K=0^{-}$) vibrational band built on 5/2[642] state. Possibly it is a mixture of both collectivity.

Adopted Levels, Gammas (continued)

γ(^{237}Np)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[b]	δ[b]	α[e]	Comments
33.19629	7/2$^+$	33.196 *1*	100	0.0	5/2$^+$	M1+E2	0.13 *3*	185 *23*	B(M1)(W.u.)=0.06 *3*; B(E2)(W.u.)=2.7×10^2 *18*
59.54092	5/2$^-$	26.3446[a] *2*	6.69 *6*	33.19629	7/2$^+$	E1		8[c] *2*	B(E1)(W.u.)=3.5×10^{-6} *12*
		59.5409[a] *1*	100 *11*	0.0	5/2$^+$	E1		1.16[c] *7*	B(E1)(W.u.)=4.5×10^{-6} *8*
75.899	9/2$^+$	42.704 *5*	100 *20*	33.19629	7/2$^+$	(M1+E2)	≈0.13	≈80	
		75.8 *2*	≈11	0.0	5/2$^+$				
102.959	7/2$^-$	27.020[f] *7*		75.899	9/2$^+$				
		43.420 *3*	100 *11*	59.54092	5/2$^-$	M1+E2	0.41 *2*	167 *9*	B(M1)(W.u.)=0.017 *10*; B(E2)(W.u.)=4.5×10^2 *25*
		69.76 *3*	4.0 *5*	33.19629	7/2$^+$	(E1)		0.336	B(E1)(W.u.)=1.5×10^{-6} *9*
		102.98 *2*	27 *3*	0.0	5/2$^+$	E1		0.121	B(E1)(W.u.)=3.2×10^{-6} *18*
129.99	11/2$^+$	54.0		75.899	9/2$^+$				E$_\gamma$: From ^{238}U(p,2nγ).
		97.1 *5*		33.19629	7/2$^+$				E$_\gamma$: From ^{237}Np(^{209}Bi,γ).
158.497	9/2$^-$	55.56 *2*	89 *9*	102.959	7/2$^-$	M1+E2	0.46 *4*	67 *6*	
		98.97 *2*	100 *2*	59.54092	5/2$^-$	E2		15.6	
		125.30 *2*	20.1 *4*	33.19629	7/2$^+$				
191.53	13/2$^+$	115.5 *4*	100	75.899	9/2$^+$				
225.957	11/2$^-$	67.45 *5*	42 *10*	158.497	9/2$^-$	(M1+E2)	0.46 *12*	31 *6*	
		123.01 *2*	100 *3*	102.959	7/2$^-$	E2		5.90	
		150.04 *3*	7.40 *21*	75.899	9/2$^+$				
267.556	3/2$^-$	164.61[#] *2*	8.6 *2*	102.959	7/2$^-$	E2		1.74	B(E2)(W.u.)=0.198 *12*
		208.005[#] *23*	100 *2*	59.54092	5/2$^-$	M1+E2	+0.156 *5*	3.18	B(M1)(W.u.)=0.000102 *7*; B(E2)(W.u.)=0.0170 *15*
		234.40[#] *4*	0.083 *3*	33.19629	7/2$^+$	M2		8.66	B(M2)(W.u.)=0.041 *3*
		267.54[#] *4*	3.32 *10*	0.0	5/2$^+$	E1+M2	0.490 *15*	1.11 *6*	B(E1)(W.u.)=1.06×10^{-8} *8*; B(M2)(W.u.)=0.163 *15*
268.80	15/2$^+$	138.7[‡] *2*	100[‡]	129.99	11/2$^+$				
281.356	1/2$^-$	13.81[#] *2*	21.4 *7*	267.556	3/2$^-$	M1+E2	0.0321 *10*	518 *16*	
		221.80[#] *4*	100 *4*	59.54092	5/2$^-$	E2		0.560	
305.05	13/2$^-$	146.55 *3*	100.0 *24*	158.497	9/2$^-$	E2		2.80	
		175.07 *4*	3.9 *2*	129.99	11/2$^+$				
316.80?		316.8[f] *2*	100	0.0	5/2$^+$				
324.420	(7/2$^-$)	165.81 *6*	54.7 *25*	158.497	9/2$^-$				
		221.46 *3*	100.0 *24*	102.959	7/2$^-$				
		249.00 *15*	1.3	75.899	9/2$^+$				
		264.89 *6*	21.2[d] *10*	59.54092	5/2$^-$				
		291.30 *20*	7.3 *7*	33.19629	7/2$^+$				
332.376	1/2$^+$	51.01[#] *3*	26.5[@] *8*	281.356	1/2$^-$	E1		0.767	B(E1)(W.u.)=0.0001194 *16*
		64.83[#] *2*	100[@] *1*	267.556	3/2$^-$	E1		0.408	B(E1)(W.u.)=0.0002195 *20*
		332.35 *3*	93.6[@] *12*	0.0	5/2$^+$	E2		0.150	B(E2)(W.u.)=0.5078 *20*
347.62	17/2$^+$	156.0[‡] *2*	100[‡]	191.53	13/2$^+$				

$^{237}_{93}Np_{144}$-6

Adopted Levels, Gammas (continued)

γ(^{237}Np) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[b]	δ[b]	α[e]	Comments
359.7	(5/2⁻)	300.13[f] *6*	100	59.54092	5/2⁻				
368.602	5/2⁺	292.77 *6*	2.86 *10*	75.899	9/2⁺				
		309.1 *3*	0.28	59.54092	5/2⁻				
		335.37 *3*	100 *2*	33.19629	7/2⁺	M1+E2	0.46 *17*	0.74 *8*	
		368.62 *3*	43.8 *10*	0.0	5/2⁺	M1(+E2)	<0.31	0.64 *2*	E_γ: Weighted average of 368.65 *3* (^{241}Am α decay) and 368.59 *4* (^{237}U β⁻ decay).
370.928	3/2⁺	38.54[#] *3*		332.376	1/2⁺	(M1+E2)	>0.65	>492	I(γ+ce)≈17% comparing I(γ+ce)(38.5γ)/I(γ+ce)(370.9γ)=40/15.3=2.6, from ^{237}U β⁻ decay, to I(γ+ce)(370.γ)=7.5 in ^{241}Am α decay.
		337.7[#] *2*	8.2 *4*	33.19629	7/2⁺	(E2)		0.143	
		370.94 *3*	100.0 *23*	0.0	5/2⁺	M1+E2	0.43 *+7−21*	0.57 *6*	
395.53	15/2⁻	169.56 *3*	100.0 *23*	225.957	11/2⁻	E2		1.55	
		204.06 *6*	1.68 *11*	191.53	13/2⁺				
434.12	(11/2⁻)	109.70 *7*	74	324.420	(7/2⁻)				
		129.2		305.05	13/2⁻				
		275.77 *8*	100 *6*	158.497	9/2⁻				
		304.21 *20*	15 *3*	129.99	11/2⁺				
		358.25 *20*	18 *4*	75.899	9/2⁺				
444.78?		120.36[f] *8*	100	324.420	(7/2⁻)				
452.52	19/2⁺	105.0[‡] *2*	100[‡] *27*	347.62	17/2⁺				
		183.8[‡] *2*	34[‡] *7*	268.80	15/2⁺				
452.545	9/2⁺	260.80 *15*	0.87[d] *14*	191.53	13/2⁺				
		322.52 *3*	110[d] *2*	129.99	11/2⁺	(M1+E2)	≈0.6	0.75 *21*	
		376.65 *3*	100 *1*	75.899	9/2⁺	(M1)		0.627	
		419.33 *4*	20.8 *6*	33.19629	7/2⁺				
		452.6 *2*	1.74 *18*	0.0	5/2⁺				
459.693	7/2⁺	135.3		324.420	(7/2⁻)				
		383.81 *3*	100.0 *24*	75.899	9/2⁺				
		426.47 *4*	87.2 *25*	33.19629	7/2⁺				
		459.68 *10*	12.9 *10*	0.0	5/2⁺				
486.21	(9/2⁻)	161.54 *10*	100	324.420	(7/2⁻)				
		260.80 *15*	[d]	225.957	11/2⁻				
497.01	17/2⁻	101.4[‡] *5*	≤20[‡]	395.53	15/2⁻				
		191.96[‡] *4*	100[‡] *20*	305.05	13/2⁻				
514.19	(3/2⁻)	154.27[f] *20*	11.6	359.7	(5/2⁻)				
		232.81 *5*	100 *6*	281.356	1/2⁻				
		246.73 *10*	52 *5*	267.556	3/2⁻				

$^{237}_{93}Np_{144}$-7

Adopted Levels, Gammas (continued)

γ(^{237}Np) (continued)

E_i(level)	J_i^π	E_γ [†]	I_γ [†]	E_f	J_f^π	Mult.[b]	Comments
514.19	(3/2$^-$)	454.66 *8*	209[d] *9*	59.54092	5/2$^-$		
		514.0 *5*	56 *6*	0.0	5/2$^+$		
544.80	21/2$^+$	197.0 *2*	100	347.62	17/2$^+$		
546.12	(5/2$^-$)	264.89 *6*	[d]	281.356	1/2$^-$		
		278.04 *15*	38	267.556	3/2$^-$		
		512.5 *3*	100 *20*	33.19629	7/2$^+$		
		545.4 *3*	64	0.0	5/2$^+$		
590.09	(7/2$^-$)	322.52 *3*	[d]	267.556	3/2$^-$		
		487.3 *3*	15.4[d]	102.959	7/2$^-$		
		590.28 *15*	100[d] *7*	0.0	5/2$^+$		
592.33	13/2$^+$	139.44 *8*	100 *21*	452.545	9/2$^+$		
		159.26 *20*	26 *10*	434.12	(11/2$^-$)		
		197.0 *2*	9.2	395.53	15/2$^-$		
		401 *3*	9.2	191.53	13/2$^+$		
		463.22 *20*	18.9	129.99	11/2$^+$		
597.99	11/2$^+$	138.5		459.693	7/2$^+$		
		406.35 *15*	50 *8*	191.53	13/2$^+$		
		468.12 *15*	100 *7*	129.99	11/2$^+$		
		522.06 *15*	30 *10*	75.899	9/2$^+$		
609.3	19/2$^-$	112.6[‡] *5*	50[‡] *13*	497.01	17/2$^-$		
		213.6[‡] *5*	100[‡] *21*	395.53	15/2$^-$		
646.03	(9/2$^-$)	487.3 *3*	[d]	158.497	9/2$^-$		I_γ: Not reported.
		586.59 *20*	100	59.54092	5/2$^-$		
666.19	(5/2$^+$,7/2$^-$)	398.64[f] *15*	159	267.556	3/2$^-$		
		590.28 *15*	[d]	75.899	9/2$^+$		I_γ: Not reported.
		632.93 *15*	100 *15*	33.19629	7/2$^+$		
		666.5 *3*	39	0.0	5/2$^+$		
681.63	23/2$^+$	136.7[‡] *2*	100[‡] *12*	544.80	21/2$^+$		
		229.3[‡] *2*	18[‡] *22*	452.52	19/2$^+$		
721.961	5/2$^-$	454.66[f] *8*	[d]	267.556	3/2$^-$		
		563.1 *3*	0.20	158.497	9/2$^-$		
		619.01 *2*	16.3 *2*	102.959	7/2$^-$		
		662.40 *2*	100.0 *22*	59.54092	5/2$^-$	E0+M1+E2	
		688.72 *4*	8.9 *2*	33.19629	7/2$^+$		
		722.01 *3*	53.8[d] *11*	0.0	5/2$^+$		
731.7	21/2$^-$	122.7[‡] *5*	≤37[‡]	609.3	19/2$^-$		
		234.6[‡] *5*	100[‡] *21*	497.01	17/2$^-$		

Adopted Levels, Gammas (continued)

γ(^{237}Np) (continued)

E_i(level)	J_i^π	E_γ [†]	I_γ [†]	E_f	J_f^π	Comments
755.685	7/2−	597.48 *8*	19.7 *9*	158.497	9/2−	
		653.02 *4*	100 *3*	102.959	7/2−	
		680.10 *10*	8 *5*	75.899	9/2+	
		696.60 *5*	14.2[d] *5*	59.54092	5/2−	
		722.01 *3*	[d]	33.19629	7/2+	I_γ: Not reported.
		755.90 *5*	20.2 *7*	0.0	5/2+	
770.57		446.43 *15*	6.1 *2*	324.420	(7/2−)	
		737.34 *5*	100 *3*	33.19629	7/2+	
		770.57 *10*	59 *3*	0.0	5/2+	
784.1	25/2+	239.3[‡] *2*	100[‡]	544.80	21/2+	
799.82	9/2−	573.94 *20*	18 *3*	225.957	11/2−	
		641.47 *5*	100 *4*	158.497	9/2−	
		669.83 *20*	5.4 *17*	129.99	11/2+	
		696.60 *5*	[d]	102.959	7/2−	
		767.00 *10*	70.4 *25*	33.19629	7/2+	
805.77	(7/2+,9/2+)	676.03 *30*	24 *5*	129.99	11/2+	
		729.72 *15*	50 *5*	75.899	9/2+	
		772.4 *3*	100 *6*	33.19629	7/2+	
		806.3 *3*	11.7	0.0	5/2+	
853.36	11/2−	529.17 *20*	82	324.420	(7/2−)	
		627.18 *20*	100 *30*	225.957	11/2−	
861.65	(5/2+,7/2)	786.00[f] *15*	46	75.899	9/2+	
		801.94 *20*	100 *10*	59.54092	5/2−	
		828.5	18 *4*	33.19629	7/2+	
		862.7 *5*	39 *4*	0.0	5/2+	
863.0	23/2−	131.8[‡] *2*	100[‡] *24*	731.7	21/2−	
		253.4[‡] *5*	18[‡] *3*	609.3	19/2−	
920.88		860.7 *5*	37 *11*	59.54092	5/2−	
		887.3 *3*	100 *23*	33.19629	7/2+	
		921.5 *3*	86 *18*	0.0	5/2+	
945.20	11/2,13/2	640.4[&] *3*	33[&] *7*	305.05	13/2−	
		675.6[&] *4*	5.4[&] *11*	268.80	15/2+	
		719.2[&] *2*	41[&] *8*	225.957	11/2−	
		753.6[&] *2*	48[&] *10*	191.53	13/2+	
		786.8[&] *2*	45[&] *9*	158.497	9/2−	
		815.3[&] *2*	100[&] *20*	129.99	11/2+	
955.9	27/2+	171.8[‡] *2*	100[‡] *6*	784.1	25/2+	

$^{237}_{93}Np_{144}$-9

Adopted Levels, Gammas (continued)

γ(^{237}Np) (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π
955.9	27/2$^+$	274.3‡ *2*	38‡ *20*	681.63	23/2$^+$	2200.9	39/2$^-$	376.4‡ *5*	100‡	1824.5	35/2$^-$
1004.9	25/2$^-$	142.7‡ *5*	28‡ *19*	863.0	23/2$^-$	2422.9	41/2$^-$	398.9‡ *5*	100‡	2024.0	37/2$^-$
		272.9‡ *2*	100‡ *23*	731.7	21/2$^-$	2473.4	43/2$^+$	333.9‡ *5*	22‡ *19*	2139.9	41/2$^+$
1064.6	29/2$^+$	280.3‡ *2*	100‡	784.1	25/2$^+$			438.5‡ *5*	100‡ *22*	2034.8	39/2$^+$
1151.3	27/2$^-$	146.0‡ *2*	100‡ *8*	1004.9	25/2$^-$	2571.4	45/2$^+$	431.4‡ *5*	100‡	2139.9	41/2$^+$
		289.8‡ *5*	14‡ *4*	863.0	23/2$^-$	2601.9	43/2$^-$	401.0‡ *5*	100‡	2200.9	39/2$^-$
1274.4	31/2$^+$	209.7‡ *2*	96‡ *89*	1064.6	29/2$^+$	2848.8	45/2$^-$	425.9‡ *5*	100‡	2422.9	41/2$^-$
		318.6‡ *2*	100‡ *91*	955.9	27/2$^+$	2947.7	47/2$^+$	376.1‡ *5*	≤62.5‡	2571.4	45/2$^+$
1312.7	29/2$^-$	160.5‡ *5*	30‡ *11*	1151.3	27/2$^-$			474.4‡ *5*	100‡ *38*	2473.4	43/2$^+$
		308.8‡ *5*	100‡ *23*	1004.9	25/2$^-$	3028.6	47/2$^-$	426.7‡ *5*	100‡	2601.9	43/2$^-$
1384.3	33/2$^+$	319.8‡ *2*	100‡	1064.6	29/2$^+$	3036.1	49/2$^+$	464.7‡ *5*	100‡	2571.4	45/2$^+$
1473.7	31/2$^-$	161.0‡ *2*	≤468‡	1312.7	29/2$^-$	3301.2	49/2$^-$	452.4‡ *5*	100‡	2848.8	45/2$^-$
		322.2‡ *5*	100‡ *26*	1151.3	27/2$^-$	3455.7	51/2$^+$	421.7‡*f* *5*	≤80‡	3036.1	49/2$^+$
1634.2	35/2$^+$	249.6‡ *5*	70‡ *64*	1384.3	33/2$^+$			508.0‡ *5*	100‡ *42*	2947.7	47/2$^+$
		359.7‡ *5*	100‡ *90*	1274.4	31/2$^+$	3481.4	51/2$^-$	452.8‡ *5*	100‡	3028.6	47/2$^-$
1653.4	33/2$^-$	179.6‡ *5*	34‡ *14*	1473.7	31/2$^-$	3532.6	53/2$^+$	496.5‡ *5*	100‡	3036.1	49/2$^+$
		341.0‡ *5*	100‡ *23*	1312.7	29/2$^-$	3780.1	53/2$^-$	478.9‡ *5*	100‡	3301.2	49/2$^-$
1743.8	37/2$^+$	359.5‡ *2*	100‡	1384.3	33/2$^+$	3961.6	55/2$^-$	480.2‡ *5*	100‡	3481.4	51/2$^-$
1824.5	35/2$^-$	350.6‡ *5*	100‡	1473.7	31/2$^-$	3994.4	55/2$^+$	538.7‡ *5*	100‡	3455.7	51/2$^+$
2024.0	37/2$^-$	199.3‡ *5*	≤47‡	1824.5	35/2$^-$	4059.2	57/2$^+$	526.6‡ *5*	100‡	3532.6	53/2$^+$
		370.8‡ *5*	100‡ *21*	1653.4	33/2$^-$	4287.8	(57/2$^-$)	507.4‡*f* *5*	100‡	3780.1	53/2$^-$
2034.8	39/2$^+$	291.1‡ *5*	36‡ *10*	1743.8	37/2$^+$	4469.6	(59/2$^-$)	508.5‡*f* *5*	100‡	3961.6	55/2$^-$
		400.3‡ *5*	100‡ *21*	1634.2	35/2$^+$	4564.5	59/2$^+$	570.1‡ *5*	100‡	3994.4	55/2$^+$
2139.9	41/2$^+$	396.1‡ *2*	100‡	1743.8	37/2$^+$	4614.6	61/2$^+$	555.4‡ *5*	100‡	4059.2	57/2$^+$

† From ^{241}Am α decay, except otherwise noted.
‡ From ^{237}Np(^{209}Bi,γ).
# From ^{237}U β^- decay.
@ From ^{237}U β^- decay.
& From ^{238}U(p,2nγ).
a From ^{237}Pu ε decay.
b Multipolarities and mixings are from ^{241}Am, ^{237}U, and ^{237}Pu decays.

$^{237}_{93}Np_{144}$-10

$\gamma(^{237}Np)$ (continued)

[c] Experimental value; transition is anomalously converted.

[d] Total observed intensity is assigned to the strong component. The relative branching of the other component could not be estimated.

[e] 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.

[f] Placement of transition in the level scheme is uncertain.

$^{237}_{93}Np_{144}$-11

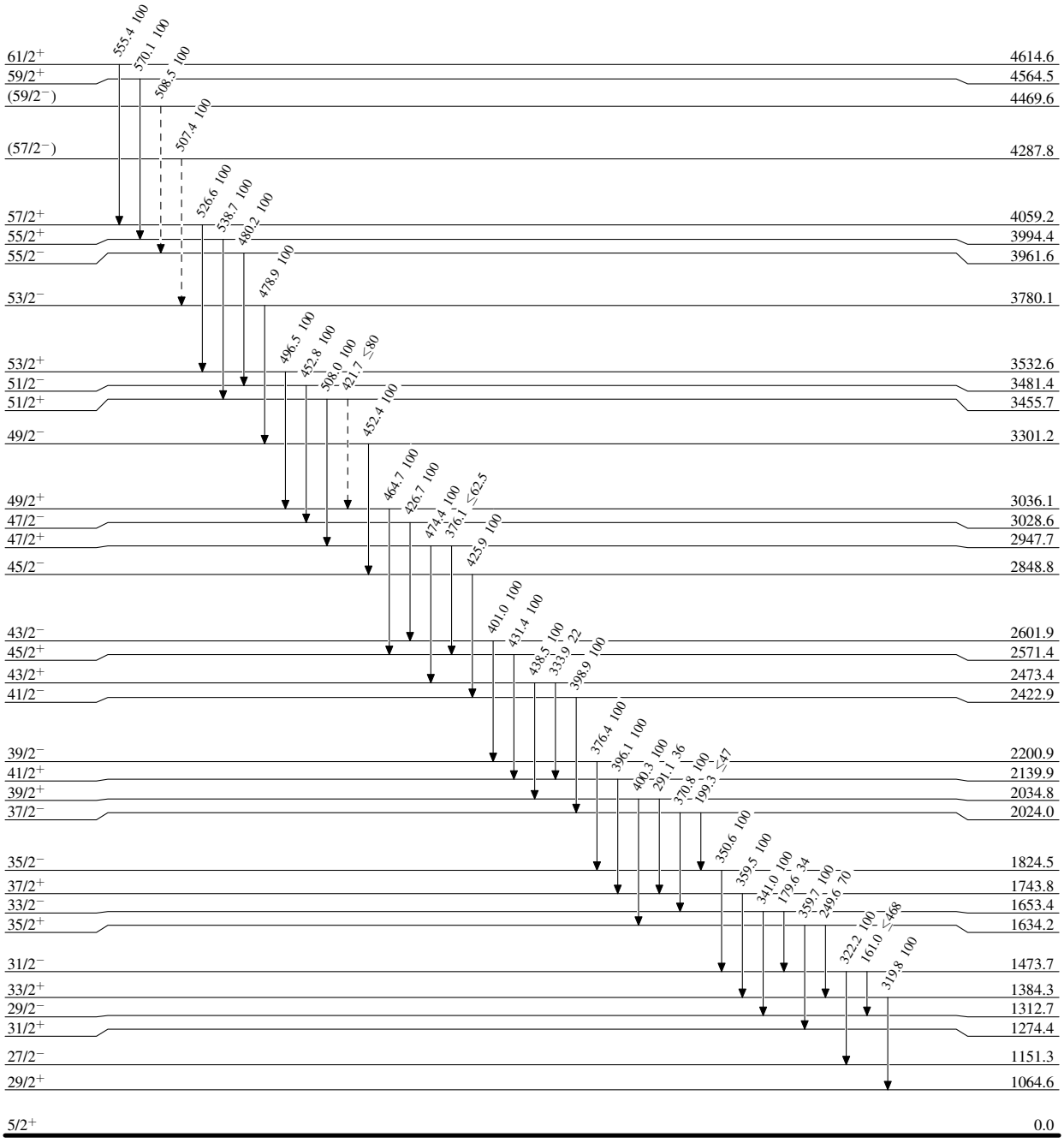
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

– – – – – – ► γ Decay (Uncertain)



$^{237}_{93}Np_{144}$ 2.144×10^6 y 7

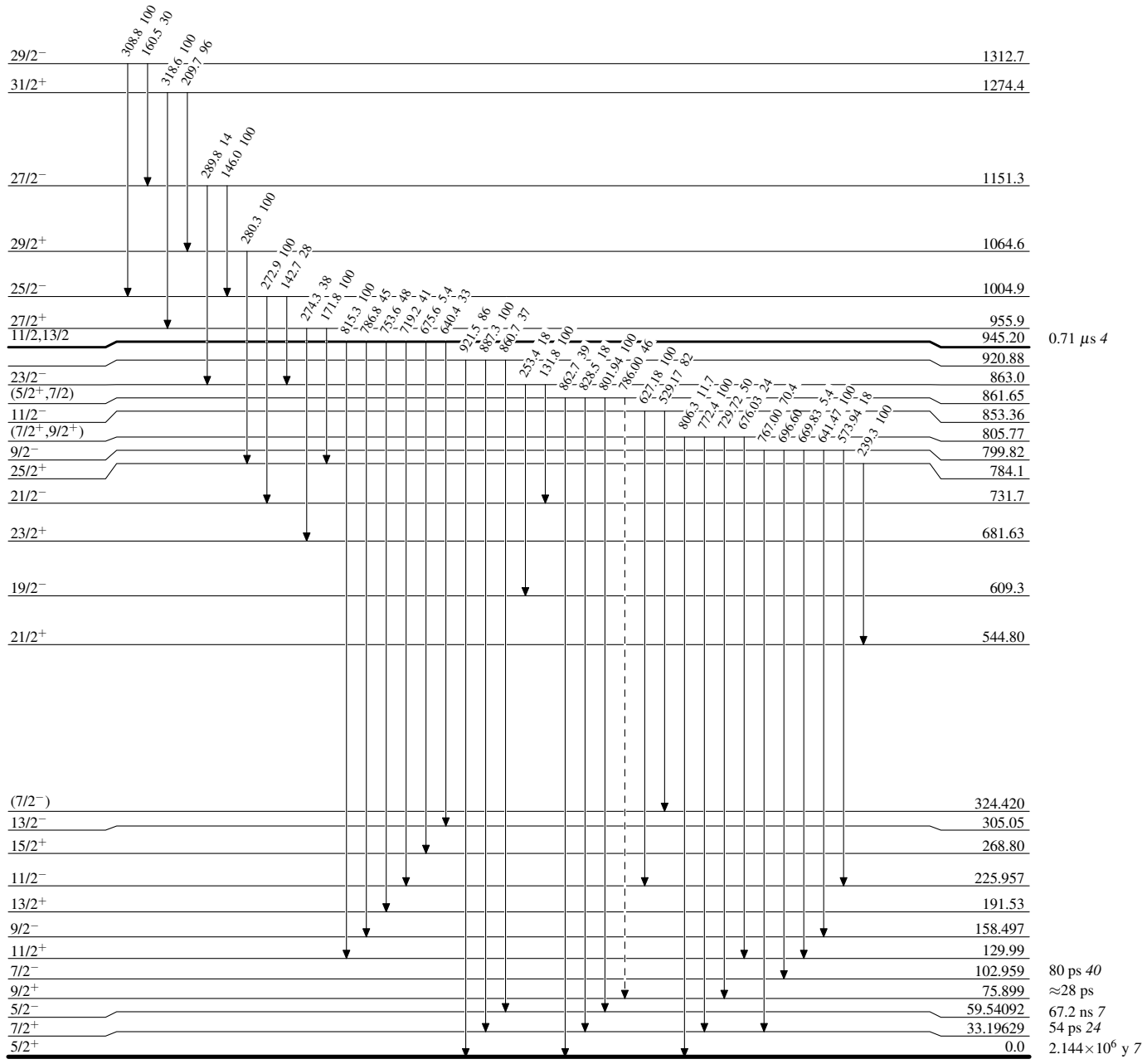
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

– – – – – – ► γ Decay (Uncertain)



$^{237}_{93}Np_{144}$

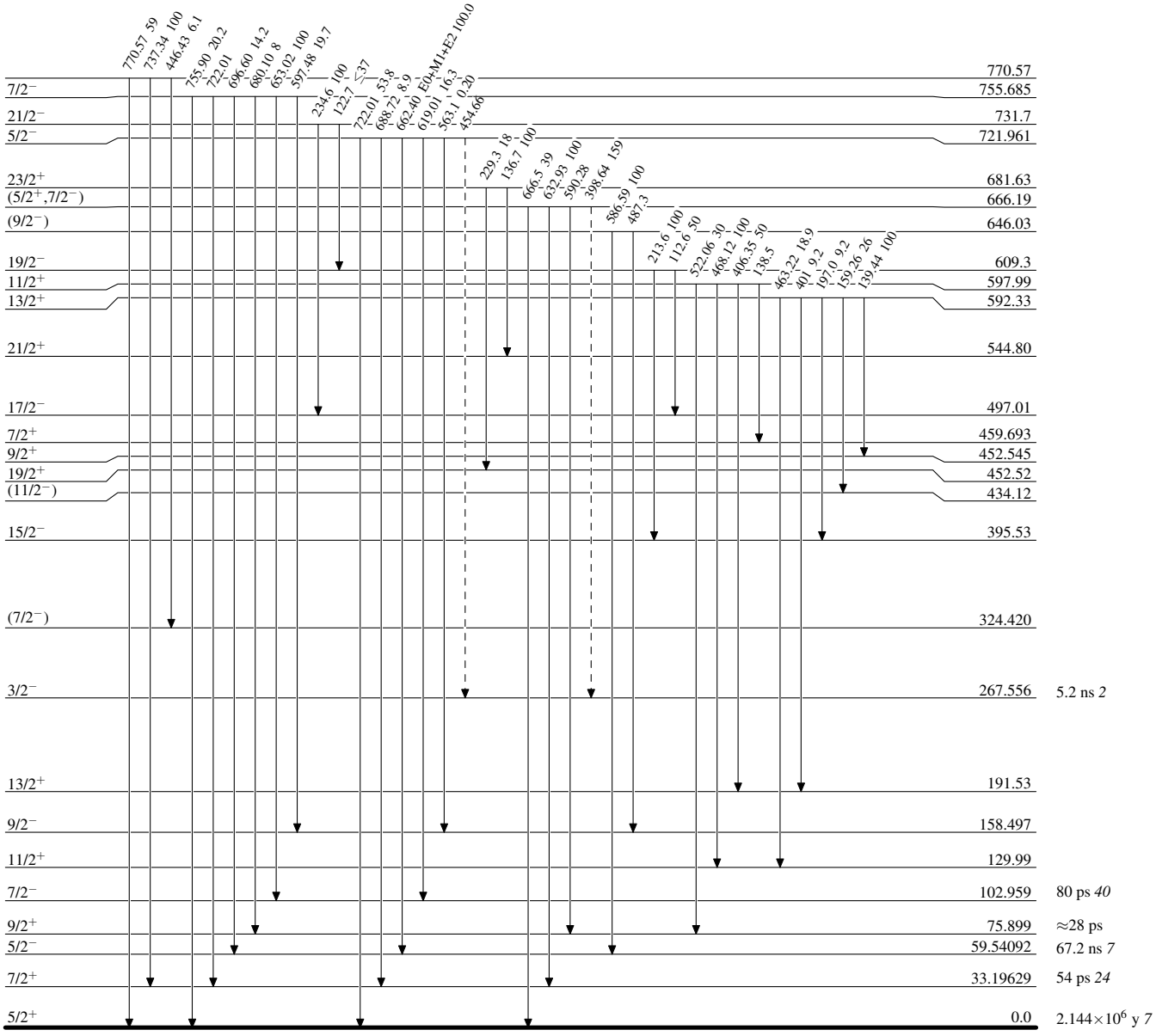
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{237}_{93}Np_{144}$

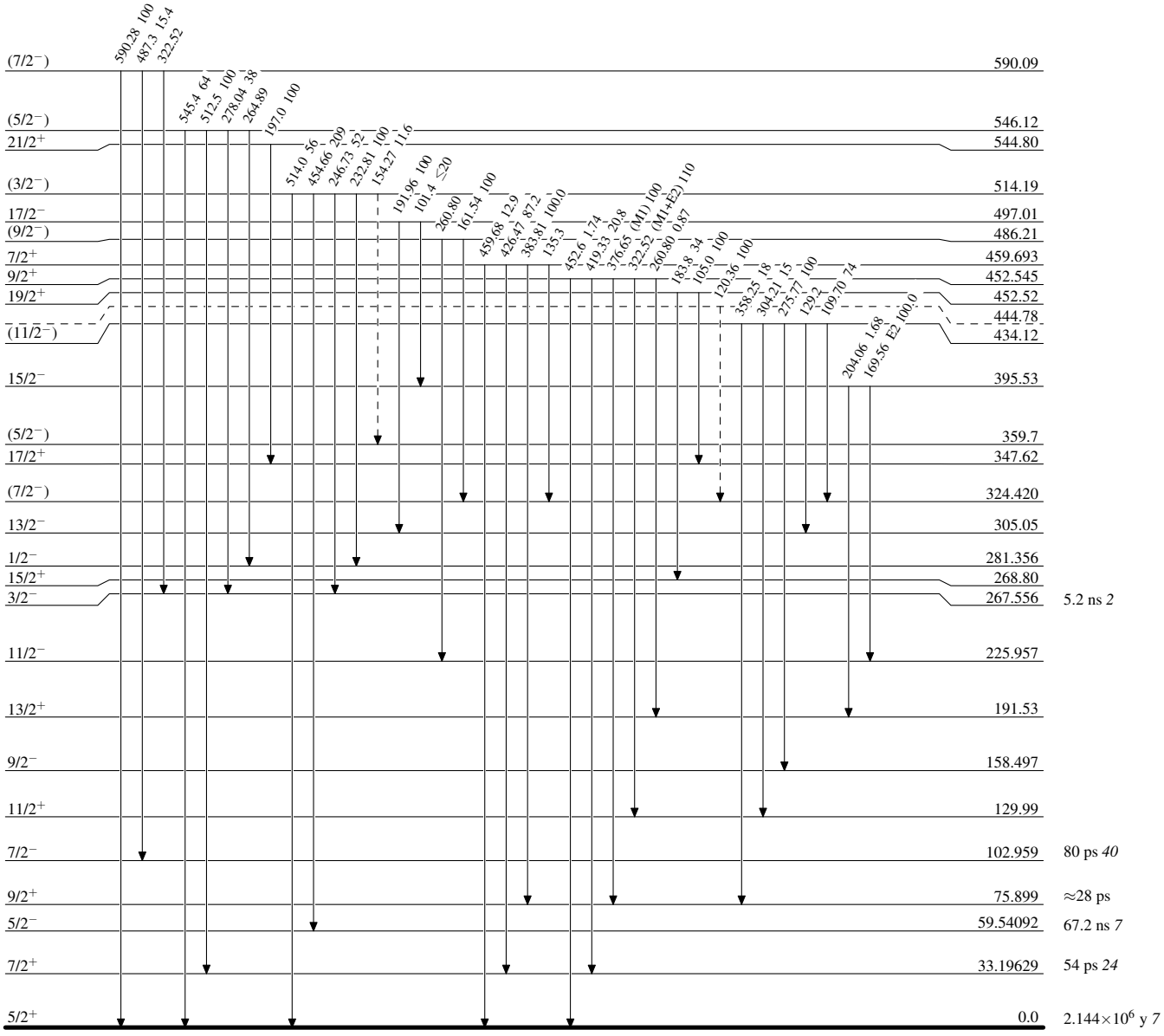
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



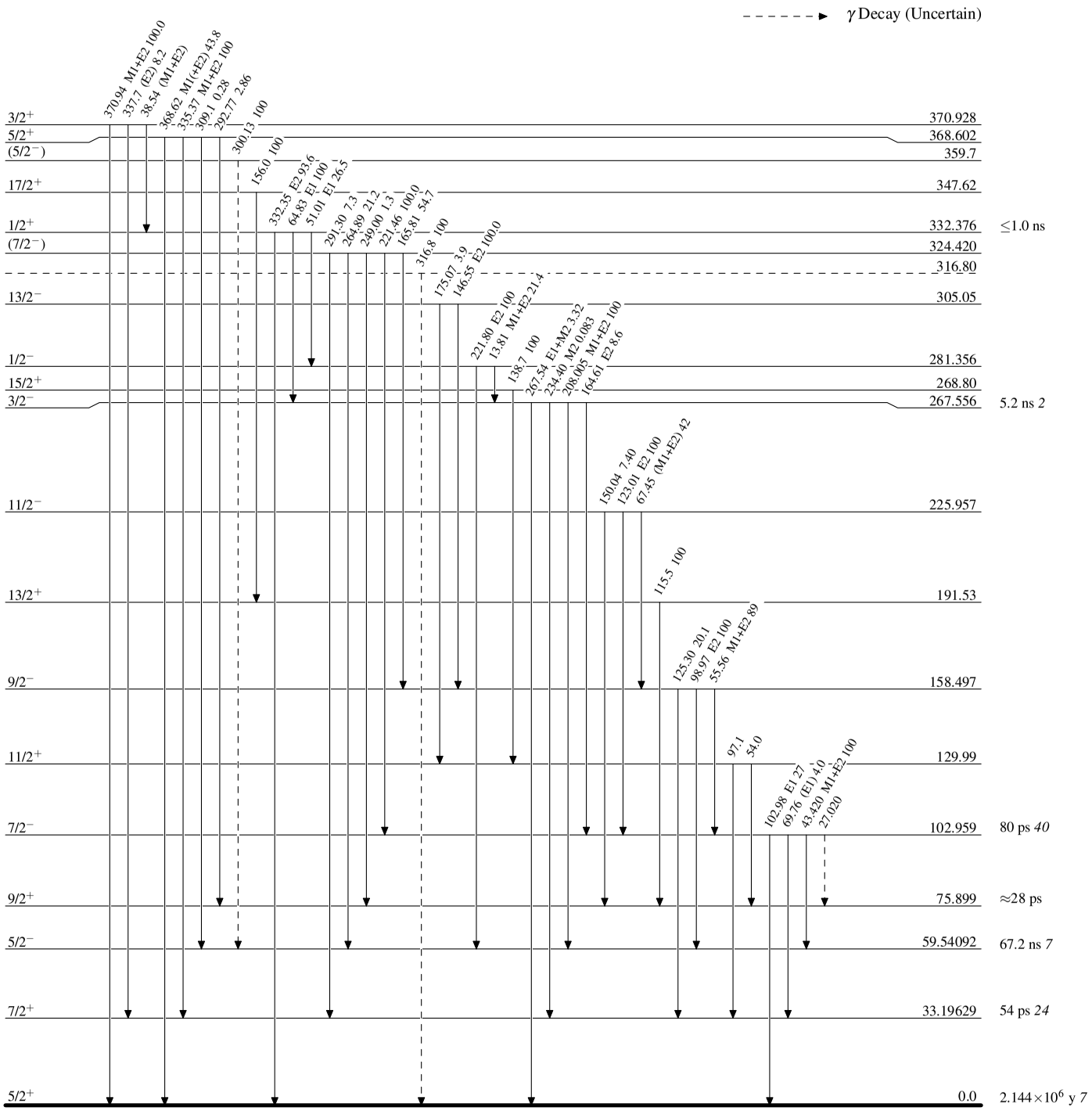
$^{237}_{93}Np_{144}$

Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

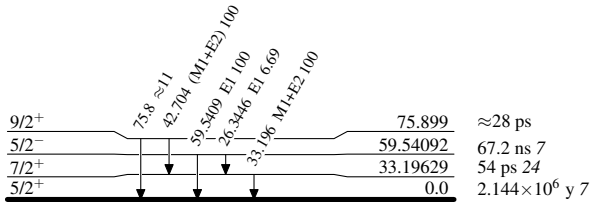


$^{237}_{93}Np_{144}$

Adopted Levels, Gammas

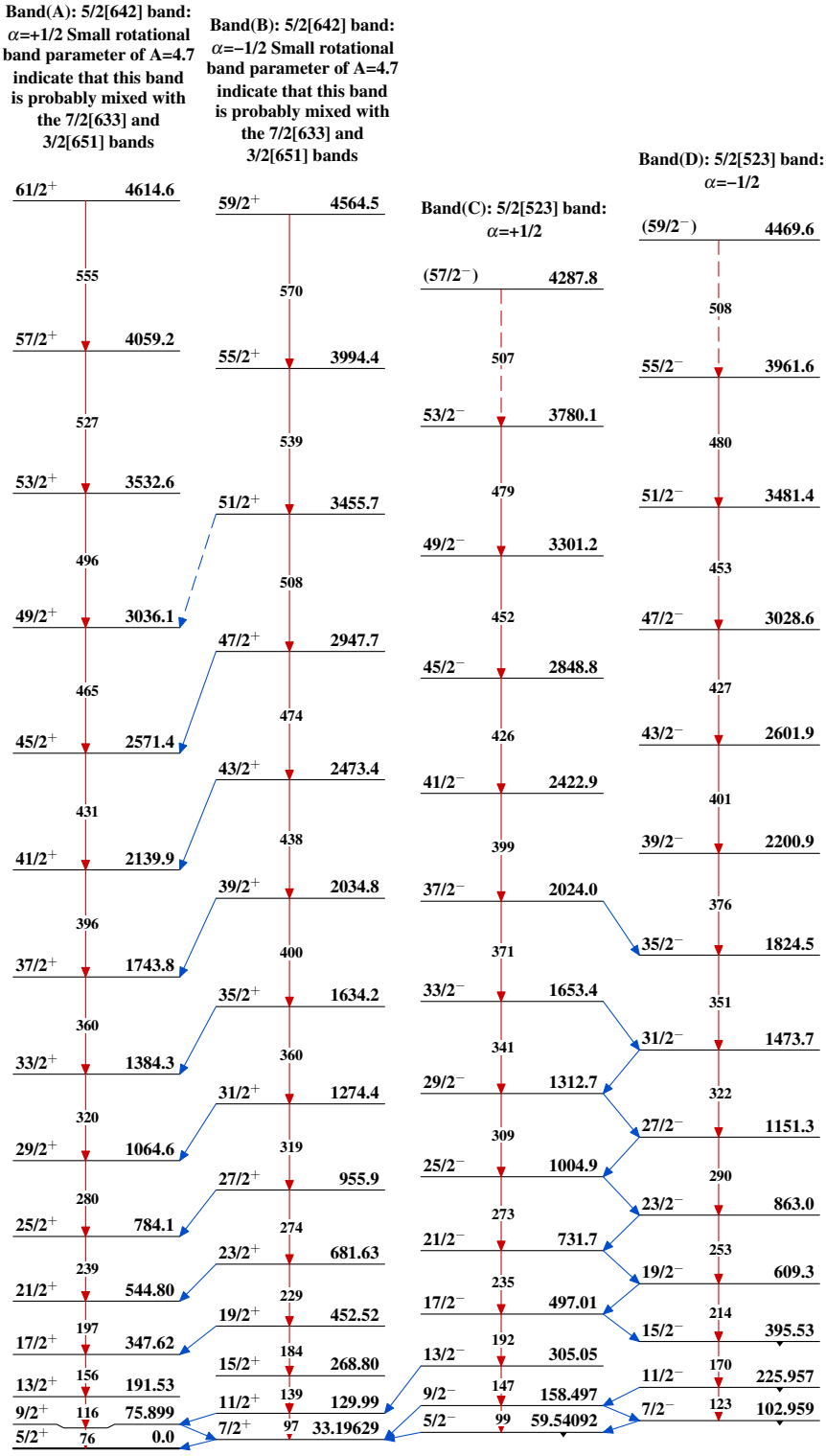
Level Scheme (continued)

Intensities: Relative photon branching from each level



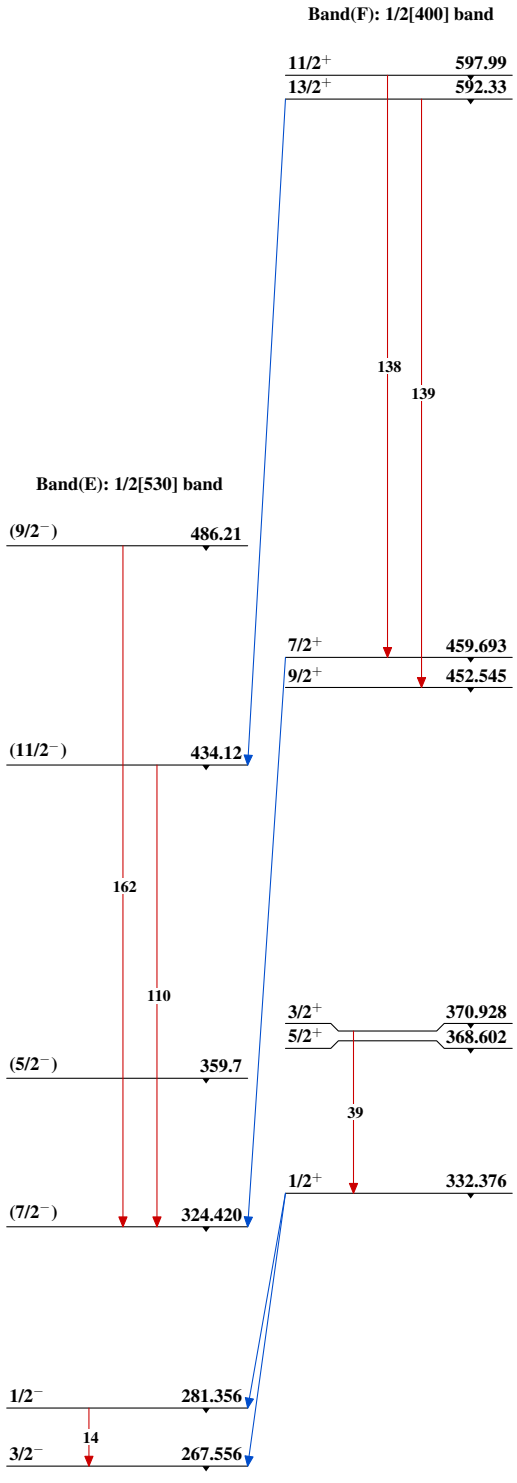
$^{237}_{93}Np_{144}$

Adopted Levels, Gammas



$^{237}_{93}Np_{144}$

Adopted Levels, Gammas (continued)



$^{237}_{93}Np_{144}$

Adopted Levels, Gammas (continued)

Band(H): $K^{\pi}=5/2^{-}$ band Low hindrance factor for the α transitions from ^{241}Am and strong E0+E2+M1 (662γ) from $5/2^{-}$ state to $5/2^{-}$[523] state, 653γ from $7/2^{-}$ to $7/2^{-}$, 5/2[523] state suggest that this is a β-vibrational band built on 5/2[523] state

$11/2^{-}$ 853.36

$9/2^{-}$ 799.82

$7/2^{-}$ 755.685

$5/2^{-}$ 721.961

Band(G): 3/2[521] band

($11/2^{-}$) 709

($9/2^{-}$) 646.03

($7/2^{-}$) 590.09

($5/2^{-}$) 546.12

($3/2^{-}$) 514.19

$^{237}_{93}Np_{144}$