Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. Browne, J. K. Tuli	NDS 127, 191 (2015)	1-Jun-2014

Q(β^-)=1291.5 *5*; S(n)=5488.3 *2*; S(p)=5224.6 *6*; Q(α)=4691 *4* 2012Wa38

Additional information 1.

Nilsson configurations are from 1990Ho02, unless otherwise noted.

For theoretical investigations see:

1987Be51 – Levels, bandhead energies.

1988Fr16 – Newby shift.

1988Qu03 – coupling effects.

1989Pl10 – level density in second potential well.

1992Gr16 – Half-life for SF.

additional list can be found in 1990Ho02.

Cluster decay.

^{238}Np(^{30}Mg): 2012Sa31, 2011Sh13, 2005Bh02.

Theory:

2013Ni03, 2012Ro34, 2011Sa40, 2010Ni02, 2008Do12, 2006Sa35, 2004Sa55, 2002Sc36.

^{238}Np Levels

Cross Reference (XREF) Flags

A	^{237}Np(n,γ) E=th:primary γ's	D	^{237}Np(d,p)
B	^{242}Am α decay (141 y)	E	^{237}Np(n,γ) E=resonance
C	^{237}Np(n,γ) E=th:secondary γ's	F	^{237}Np(n,γ) E=res:avg

E(level)[m]	J$^{\pi}$[n]	T$_{1/2}$	XREF	Comments
0.0[†i]	2$^+$	2.099 d *2*	ABCD	%β^-=100 T$_{1/2}$: Weighted average of 2.1023 d *7*, 2.1024 d *9*, 2.1026 d *9* from (2006Re09), and 2.0980 d *3* (1990Ch35). Other values: 2.117 d *2* (1966Qa01), 2.10 d *1* (1950Fr53).
26.4266[†i] *21*	3$^+$		BCDE	J$^{\pi}$: M1+E2 to g.s. Member of band built on the g.s.
62.330[†i] *4*	4$^+$		BCD	J$^{\pi}$: member of g.s. band. M1+E2 to 3$^+$.
86.6738[‡i] *18*	3$^+$		BCD	
106.155[†i] *15*	5$^+$		BCD	J$^{\pi}$: member of g.s. band. M1+E2 to 4$^+$.
121.645[‡i] *9*	4$^+$		BCD	J$^{\pi}$: band member. M1 γ's to 3$^+$ and 4$^+$.
136.0450[#i] *23*	3$^-$	6.0 ns	ABC EF	T$_{1/2}$: from $\alpha\gamma$(t) (1966As06).
161.685[†i] *24*	6$^+$		B	J$^{\pi}$: member of g.s. band.
165.532[‡i] *15*	5$^+$		BCD	J$^{\pi}$: band member. M1+E2 γ to 4$^+$.
179.154[#i] *7*	4$^-$		BC EF	
182.8775[@i] *18*	2$^-$		ABC EF	J$^{\pi}$: band head. E1 γ's to 2$^+$ and 3$^+$.
215.522[@i] *4*	3$^-$		ABC EF	J$^{\pi}$: band member. E1 γ's to 2$^+$ and 3$^+$.
217.949[aj] *10*	0$^-$		C	J$^{\pi}$: E2 to 2$^-$. M2 to 2$^+$. Not fed in (n,γ) from thermal, resonance, or average resonance capture; therefore, J not 1 to 4. Probable K^{π}=0$^-$ bandhead.
218.7[‡j] *6*	(6$^+$)		B D	J$^{\pi}$: probable band member. γ from 7$^+$. E(level): no deexciting transitions assigned by authors. Their energy of 218.7 *6* comes from feeding via a 170.5γ from the 389 level. On the basis of an energy fit, the evaluators suggest possible placement of a 52.98γ feeding the 5$^+$ member of the assigned band at 165.59. This would give E(level)=218.57 *8*. The (d,p) level at 221.2 *8* is assigned by 1990Ho02 as being the same level.
232.828[#i] *8*	5$^-$		BC	J$^{\pi}$: probable band member. M1+E2 to 4$^-$. Not seen in primary, average, or in resonance capture; therefore, J^{π} not 1$^-$ to 4$^-$.

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Adopted Levels, Gammas (continued)

^{238}Np Levels (continued)

E(level)[m]	J^{π}[n]	XREF	Comments
243.959[bj] 4	$(1)^+$	C	J^π: probable bandhead. M1+E2 to 2^+.
246.4 14	1 to 4	A E	
250.33[gk] 3	(1^+)	B	J^π: possible band member. γ to 2^+.
250.39[ak] 4	$(2)^-$	A C EF	J^π: possible band member. $J^\pi=1^-$ to 3^- from average resonance capture and feeding from a 2^+ resonance in (n,γ). (E1) to 3^+.
258.853[@i] 8	4^-	ABC EF	J^π: band member. M1+E2 to 3^-. E2 to 2^-.
275.519[&i] 9	5^+	BCD	J^π: band head. M1+E2 to 4^+.
277.641[bk] 18	$(2)^+$	C	J^π: possible band member. E2(+M1) to 3^+. γ to 2^+.
285.8? 10	1 to 4	A	
297.03[#j] 5	(6^-)	B	J^π: probable band member. γ's to 5^+.
298.368[bj] 8	3^+	C	J^π: probable band member. M1 γ's to 2^+ and 4^+.
299.23[gj] 6	(3^+)	B	J^π: probable band member. γ's to 2^+ and 4^+.
299.788[fj] 20	$(1)^-$	C F	J^π: probable band head. $J^\pi=1^-$ to 4^- from population in average resonance capture. γ to 2^-.
300.68 7	1^-,2,3,4^-	B	J^π: γ's to 3^-.
300.743[ej] 16	(6^-)	B	J^π: probable band head. γ's to 4^-, 5^-, and 5^+. Not seen in thermal, average resonance, or resonance capture; therefore J not 1 to 4.
305.4 20	1^- to 4^-	F	E(level),J^π: 1990Ho02 assign E=305.4 20 from their average resonance capture work, with J^π thus 1^- to 4^-. The evaluators note that a 218.56γ-126.21γ cascade from the 523.87 3+,4^+ level to the 179.150 4^- level would yield E=305.34 3 for the intermediate level; however, mult(218.56γ) is M1+E2 so the resulting J^π(305) would be 3^+ to 5^+. The energy agreement may be fortuitous; however, one notes from fig. 3 of 1990Ho02 that the Iγ/Eγ^5 value for the 305 level overlaps the calculated range for $J^\pi=1^+$ to 4^+.
312.704[@i] 19	5^-	BC	J^π: band member. M1+E2 to 4^-.
315.063 8	4^+,5^+	C	J^π: E1+M2 to 5^-. γ to 3^-.
324.314[ak] 8	$(4)^-$	C F	J^π: possible band member. γ to 3^-. $J^\pi=1^-$ to 4^- from arc.
325.210[ak] 9	1^-	A C EF	J^π: M1 to 0^-.
328.6[&i] 5	6^+	B D	J^π: band member. E(level): E=328.6 5 from (d,p). 1990Ho09 place the 163.25γ from this level; however, this transition is doubly placed, and all of the intensity can be accounted for by placement from the 342 level. The authors' coincidence work does not seem to require a component from this level. If a component of the 163γ does indeed deexcite this level, then E(level) can be established as 328.84 4.
334.0 6	1^- to 3^-	AB EF	E(level): weighted average of 334.7 8 from arc and 333.4 7 from primary γ's in thermal and resonance capture. E=334.8 for a tentative level in α decay.
342.439[hi] 8	5^-	BC	J^π: band head. E1 to 5^+. γ to 3^-. Not seen in arc.
348.8 9	1^- to 3^-	A EF	E(level): from primary γ's in thermal and resonance capture. E=347.1 23 in arc.
352.46[fk] 4	$(3)^-$	C EF	J^π: possible band member. Fed by primary γ's in arc and from a 2^+ resonance.
367.26[fk] 3	$(2)^-$	A C EF	J^π: possible band member. Fed by primary γ in arc.
373.684[ck] 14	$(1)^-$	A C EF	J^π: possible band head. (M1) to 1^-. γ to 0^-. Fed by primary γ in arc.
374.7[gj] 10	(5^+)	B D	E(level): from (d,p). J^π: probable band member. σ(exp) in (d,p) agrees with σ(calc).
376.70[@j] 7	(6^-)	B	J^π: probable band member. γ's to 4^- and 5^+.
380.60[ak] 4	$(3)^-$	C F	J^π: possible band member. E2(+M1) to 2^-. Fed by primary γ in arc.
386.3 3	1 to 4	A E	E(level): weighted average of 386.3 3 from primary γ's in thermal capture, and 386.2 5 in resonance capture.
389.4[&i] 5	7^+	B D	E(level): weighted average of 389.9 9 in (d,p), and 389.2 6 in α decay. J^π: band member.
395.198[bl] 17	$(5)^+$	C	J^π: possible band member. Not populated in primary, average resonance, or in resonance capture; therefore J not 1 to 4.M1+E2 to 5^+.
397.3 15		B	E(level): from Eα.
407.59[hi] 6	6^-	B	J^π: band member.
409.5[el] 5	(8^-)	D	J^π: possible band member. σ(exp) in (d,p) agrees with σ(calc).

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Adopted Levels, Gammas (continued)

^{238}Np Levels (continued)

E(level)[m]	J^{π}[n]	XREF	Comments
417.641 *12*	$2^+,3^+,4^+$	C	J^{π}: M1+E2 to 3^+.
431.3[gj] *6*	(4^+)	D	J^{π}: probable band member. σ(exp) in (d,p) agrees with σ(calc).
433.716 *13*	$3^+,4^+$	C	J^{π}: E1 γ's to 3^- and 4^-.
442.23[fk] *3*	$(4)^-$	A C EF	J^{π}: possible band member. Fed by primary in arc.
456.3[&k] *7*	(8^+)	D	J^{π}: possible band member.
457.65 *19*	1^- to 3^-	A EF	E(level): weighted average of 457.37 *24* from primary γ's in thermal and resonance capture, and 458.1 *3* in arc.
459.6[dj] *6*	(6^+)	B	J^{π}: probable band head. HF in α decay.
469.1 *12*	1^- to 4^-	B F	
473.3 *4*	1^- to 4^-	F	
484[hi] *3*	7^-	B	J^{π}: band member. HF in α decay.
497.20 *3*	$2^-,3^-,4^-$	C F	J^{π}: M1+E2 to 3^-. If the doubly placed 314γ has most of its intensity here, then its M1+E2 character to 2^- rules out 4^-.
505.1 *10*	1^- to 4^-	F	
523.83 *3*	$3^+,4^+,5^+$	C	J^{π}: M1+E2 to 4^+.
524.2[gj] *6*	(6^+)	D	J^{π}: probable band member. σ(exp) in (d,p) agrees with σ(calc).
525.3[dk] *15*	(7^+)	B	J^{π}: possible band member.
529.857 *10*	3^-	A C EF	J^{π}: E2 to 5^-. M1+E2 to 2^-.
543.24 *4*	$3^-,4^-$	C F	J^{π}: fed by primary in arc. γ to 5^-.
567.023 *13*	3^-	A C EF	J^{π}: E2 to 5^-. M1+E2 to 2^-.
578 *3*		B	
584.5 *3*	1^- to 4^-	A F	E(level): weighted average of 584.9 *4* from average resonance capture, and 584.2 *4* from primary γ in thermal capture.
601.2 *3*	1^- to 3^-	A EF	E(level): weighted average of 601.1 *4* from primary γ's in thermal and resonance capture, and 601.4 *4* from arc.
603.7 *6*		D	
619.5 *3*	1 to 4	EF	E(level): from primary γ in thermal capture. E=623.6 *15* from resonance capture.
630.6 *13*		D	
635.3 *10*	1^- to 4^-	EF	
646.76 *4*	$2^+,3^+,(4)^+$	C	J^{π}: M1+E2 to 3^+. E2(+M1) to 2^+.
648.1 *9*	1^- to 3^-	A DEF	E(level): weighted average of 649.0 *6* from average resonance capture, 645.9 *7* from primary γ's in thermal and resonance capture, and 648.7 *5* from (d,p).
673.6 *3*	1^- to 3^-	A dEF	XREF: d(675.6). E(level): weighted average of 673.7 *3* from primary γ's in thermal and resonance capture, and 672.7 *10* in arc.
676.9 *18*	1^- to 4^-	d F	XREF: d(675.6).
692.1 *3*	1^- to 3^-	A DEF	E(level): weighted average of 691.9 *6* from (d,p), 692.1 *3* from arc, and 692.2 *3* from primary γ's in thermal and resonance capture.
709.24 *25*		A	
722.4 *7*		A	
764.1 *6*		A	
782.4 *6*		A	
797.4 *4*		A	
800.4 *8*		A	
809.8 *3*		A	
813.9 *7*		A	
834.7 *6*		A	
869.0 *5*		A	
903.3 *4*		A	
916.6 *8*		A	
929.1? *6*		A	
948.9? *6*		A	
970.7? *6*		A	
986.5? *4*		A	
1026.6? *6*		A	

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Adopted Levels, Gammas (continued)

^{238}Np Levels (continued)

E(level)[m]	$T_{1/2}$	XREF	Comments
1033.4? 7		A	
1046.5? 6		A	
1065.2? 5		A	
1081.0? 6		A	
1089.0? 6		A	
1107.8 7		A	
1119.6? 7		A	E(level): the authors′ value of 1197.6 in table I is a misprint.
1143.0 6		A	
1163.1 4		A	E(level): the authors′ value of 1153.1 is a misprint, or else Eγ is incorrect.
1176.1 6		A	
1256.1 3		A	
1260.5 6		A	
1276.1 5		A	
1291.3 4		A	
1313.5 3		A	
1330.7 6		A	
1364.8 7		A	
1369.8 7		A	
1375.6 4		A	
1384.6 3		A	
1392.8 5		A	
1408.5 6		A	
1445.7 6		A	
1484.1 8		A	
1492.8? 7		A	
1509.0 5		A	
1546.5 7		A	
1711.5 5		A	
1822.5 6		A	
2104.3 6		A	
2109.5 5		A	
2300	112 ns 39		%SF≤100 %SF: only SF activity was observed by 1970Vi05. γ branch from a shape isomer with $T_{1/2}$ between 2 μs and 20 ms was searched for its decay by 1974Bo02 in ^{238}U(p,n) reaction, and no γ could be assigned definitely. Upper limit on the isomeric ratio was found by 1976Vo04 by $\gamma\gamma$(t) in ^{237}Np(thermal n) reaction for an isomer with $T_{1/2}$=70-200 ns. $T_{1/2}$: measured by 1970Vi05 in ^{237}Np(d,p), ^{238}U(d,2n). No SF isomer was observed in ^{237}Np(d,p) with 10 ns≤$T_{1/2}$≤1 μs (1969La14). No SF isomer was observed in ^{238}U(d,2n) with $T_{1/2}$>1 ns (1970Po01). $T_{1/2}$ for fission was calculated as 52 s by 1972We09, and as 20000-2000 s by 1971Ba30. $T_{1/2}(\gamma)$=2.3 s was calculated also by 1972We09. E(level): E(level)=2100 calculated by 1971Ba30, E(level)=2300 calculated by 1972We09, E(level)=2200 calculated by 1969Ni13.
2857.4 6		A	

[†] Band(A): $K^\pi=2^+$ 5/2(642)-ν 1/2(631).
[‡] Band(B): $K^\pi=3^+$ 5/2(642)+ν 1/2(631).
[#] Band(C): $K^\pi=3^-$ 5/2(523)+ν 1/2(631).
[@] Band(D): $K^\pi=2^-$ 5/2(523)-ν 1/2(631).
[&] Band(E): $K^\pi=5^+$ 5/2(642)+ν 5/2(622).
[a] Band(F): $K^\pi=0^-$ 1/2(530)-ν 1/2(631).

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Adopted Levels, Gammas (continued)

^{238}Np Levels (continued)

[b] Band(G): $K^{\pi}=0^{+}$ 1/2(400)-ν 1/2(631).
[c] Band(H): $K^{\pi}=1^{-}$ 1/2(530)+ν 1/2(631).
[d] Band(I): $K^{\pi}=6^{+}$ 5/2(523)+ν 7/2(743).
[e] Band(J): $K^{\pi}=6^{-}$ 5/2(642)+ν 7/2(743).
[f] Band(K): $K^{\pi}=0^{-}$ 5/2(523)-ν 5/2(622).
[g] Band(L): $K^{\pi}=0^{+}$ 5/2(642)-ν 5/2(622).
[h] Band(M): $K^{\pi}=5^{-}$ 5/2(523)+ν 5/2(622).
[i] 1990Ho02 estimate confidence in the evidence for a level configuration as well established.
[j] 1990Ho02 estimate confidence in the evidence for a level configuration as probable.
[k] 1990Ho02 estimate confidence in the evidence for a level configuration as plausible.
[l] 1990Ho02 estimate confidence in the evidence for a level configuration as speculative.
[m] From a least-squares fit to the adopted Eγ's, except where noted otherwise.
[n] The J^{π} assignments start with the following model-independent data: $J^{\pi}(342)=5^{-}$ based on HF(α)=2.01 *7* from 5^{-}. J(g.s.)=2, a measured value (see 1976Fu06) with π(g.s.)=+ from an E1, M1+E2, M1, M1 cascade from the 342 level. $J^{\pi}(136)=3^{-}$ can then be established based on an M1+E2, M1+E2 cascade from the 342 level, and an E1 to the 2^{+} g.s. $J^{\pi}(179)=4^{-}$ follows from an M1+E2 from 342 and an M1+E2 to 136, and $J^{\pi}(86)=3^{+}$ based on an E1 from 179 and an M1+E2 to g.s. The g.s., 86 level, and 136 levels are bandheads of $K^{\pi}=2^{+}$, 3^{+}, and 3^{-} bands, respectively. The 342 level is a $K^{\pi}=5^{-}$ bandhead. Other adopted J^{π}'s are based on band assignments of 1990Ho02, in addition to transition multipolarities as noted. In general, J^{π} assignments of 1 to 4 are based on feeding by primary γ's in thermal (n,γ), $J^{\pi}=1^{-}$ to 4^{-} assignments are based on feeding by primary γ's in average resonance capture and $J^{\pi}=1^{-}$ to 3^{-} assignments are based on feeding by primary γ's in average resonance capture and from a 2^{+} resonance.
[o] $T_{1/2}$=50 ns for a level at E=300, from $\alpha\gamma$(t) (1966As06).

Adopted Levels, Gammas (continued)

$\gamma(^{238}\mathrm{Np})$

E_i(level)	J_i^π	E_γ[‡]	I_γ[#]	E_f	J_f^π	Mult.	δ[f]	α[†]	Comments
26.4266	3^+	26.43 *2*	100	0.0	2^+	M1+E2	0.097 *6*	333 *12*	α(L)=248 *9*; α(M)=62.7 *23*; α(N+..)=21.9 *8* α(N)=17.0 *6*; α(O)=4.13 *15*; α(P)=0.767 *24*; α(Q)=0.0469 *7*
62.330	4^+	35.90 *2*	83 *17*	26.4266	3^+	M1+E2	0.130 *3*	133.6 *24*	α(L)=99.8 *18*; α(M)=25.1 *5*; α(N+..)=8.78 *16* α(N)=6.81 *13*; α(O)=1.65 *3*; α(P)=0.307 *6*; α(Q)=0.0188 *3*
		62.33 *3*	100	0.0	2^+	E2		136.0	α(L)=98.9 *14*; α(M)=27.5 *4*; α(N+..)=9.55 *14* α(N)=7.52 *11*; α(O)=1.749 *25*; α(P)=0.285 *4*; α(Q)=0.000809 *12*
86.6738	3^+	24.37 *2*	0.28 *4*	62.330	4^+	M1(+E2)	≤0.03	326 *8*	α(L)=244 *6*; α(M)=60.3 *15*; α(N+..)=21.2 *5* α(N)=16.3 *4*; α(O)=4.02 *10*; α(P)=0.779 *17*; α(Q)=0.0598 *9*
		60.243 *4*	29.6 *22*	26.4266	3^+	M1+E2	0.089 *23*	23.5 *7*	α(L)=17.6 *6*; α(M)=4.32 *15*; α(N+..)=1.52 *5* α(N)=1.17 *4*; α(O)=0.287 *9*; α(P)=0.0553 *15*; α(Q)=0.00410 *6*
		86.676 *2*	100 *17*	0.0	2^+	M1+E2	0.10 *3*	7.95 *18*	α(L)=5.98 *13*; α(M)=1.46 *4*; α(N+..)=0.513 *13* α(N)=0.395 *10*; α(O)=0.0972 *23*; α(P)=0.0188 *4*; α(Q)=0.001413 *22*
106.155	5^+	43.84 *3*	100	62.330	4^+	M1+E2	0.111 *5*	65.3 *12*	α(L)=48.9 *9*; α(M)=12.12 *24*; α(N+..)=4.25 *8* α(N)=3.29 *7*; α(O)=0.803 *15*; α(P)=0.152 *3*; α(Q)=0.01043 *15*
		79.74 *3*	32 *7*	26.4266	3^+	E2		42.0	α(L)=30.6 *5*; α(M)=8.51 *12*; α(N+..)=2.96 *5* α(N)=2.33 *4*; α(O)=0.542 *8*; α(P)=0.0888 *13*; α(Q)=0.000294 *5*
121.645	4^+	34.97 *3*	93 *13*	86.6738	3^+	M1		110.8	α(L)=83.4 *12*; α(M)=20.3 *3*; α(N+..)=7.14 *11* α(N)=5.50 *8*; α(O)=1.355 *20*; α(P)=0.263 *4*; α(Q)=0.0205 *3*
		59.31 *4*	9.3 *15*	62.330	4^+	M1		23.4	α(L)=17.64 *25*; α(M)=4.29 *6*; α(N+..)=1.507 *22* α(N)=1.161 *17*; α(O)=0.286 *4*; α(P)=0.0556 *8*; α(Q)=0.00432 *7*
		95.22 *2*	52 *7*	26.4266	3^+	(M1)		5.90	α(L)=4.44 *7*; α(M)=1.078 *16*; α(N+..)=0.379 *6* α(N)=0.292 *4*; α(O)=0.0719 *10*; α(P)=0.01397 *20*; α(Q)=0.001084 *16*
		121.69 *4*	100 *15*	0.0	2^+	E2		6.04	α(K)=0.179 *3*; α(L)=4.26 *6*; α(M)=1.186 *17*; α(N+..)=0.412 *6* α(N)=0.324 *5*; α(O)=0.0756 *11*; α(P)=0.01251 *18*; α(Q)=6.14×10^{-5} *9*
136.0450	3^-	49.372 *2*	100.0 *16*	86.6738	3^+	E1		0.820	B(E1)(W.u.)=1.1×10^{-4} α(L)=0.615 *9*; α(M)=0.1536 *22*; α(N+..)=0.0518 *8* α(N)=0.0408 *6*; α(O)=0.00939 *14*; α(P)=0.001508 *22*; α(Q)=5.32×10^{-5} *8*
		73.715 *4*	5.7 *18*	62.330	4^+	E1		0.285	B(E1)(W.u.)=2.0×10^{-6} α(L)=0.215 *3*; α(M)=0.0529 *8*; α(N+..)=0.0180 *3* α(N)=0.01411 *20*; α(O)=0.00330 *5*; α(P)=0.000557 *8*; α(Q)=2.30×10^{-5} *4*
		109.614[ic] *4*	10[ic] *4*	26.4266	3^+	E1+M2[c]	0.026 *6*	0.138 *19*	B(E1)(W.u.)=1.0×10^{-6}
		136.045 *10*	7.9 *13*	0.0	2^+	E1		0.247	B(E1)(W.u.)=4.3×10^{-7} α(K)=0.190 *3*; α(L)=0.0436 *6*; α(M)=0.01064 *15*; α(N+..)=0.00366 *6* α(N)=0.00285 *4*; α(O)=0.000679 *10*; α(P)=0.0001206 *17*; α(Q)=6.09×10^{-6} *9*

$^{238}_{93}\mathrm{Np}_{145}$-6

$\gamma(^{238}Np)$ (continued)

E_i(level)	J^π_i	E_γ[‡]	I_γ[#]	E_f	J^π_f	Mult.	δ[f]	α[†]	Comments
165.532	5^+	43.98 *4*		121.645	4^+	M1+E2	0.13 *4*	68 *8*	α(L)=51 *6*; α(M)=12.6 *16*; α(N+..)=4.4 *6* α(N)=3.4 *5*; α(O)=0.83 *10*; α(P)=0.157 *17*; α(Q)=0.01030 *17*
		139.05 *2*		26.4266	3^+	[E2]		3.41	α(K)=0.211 *3*; α(L)=2.32 *4*; α(M)=0.647 *9*; α(N+..)=0.225 *4* α(N)=0.1767 *25*; α(O)=0.0413 *6*; α(P)=0.00685 *10*; α(Q)=3.96×10^{-5} *6*
179.154	4^-	43.11 *3*	23 *4*	136.0450	3^-	M1+E2	0.08 *2*	65 *3*	α(L)=48.5 *21*; α(M)=11.9 *6*; α(N+..)=4.18 *20* α(N)=3.23 *16*; α(O)=0.79 *4*; α(P)=0.152 *6*; α(Q)=0.01100 *16*
		92.486 *7*	100 *21*	86.6738	3^+	E1		0.1574	α(L)=0.1184 *17*; α(M)=0.0291 *4*; α(N+..)=0.00993 *14* α(N)=0.00777 *11*; α(O)=0.00183 *3*; α(P)=0.000316 *5*; α(Q)=1.410×10^{-5} *20*
		152.69[he]	≤174[h]	26.4266	3^+	(E1)[e]		0.189	α(K)=0.1458 *21*; α(L)=0.0325 *5*; α(M)=0.00792 *11*; α(N+..)=0.00272 *4* α(N)=0.00212 *3*; α(O)=0.000507 *7*; α(P)=9.07×10^{-5} *13*; α(Q)=4.73×10^{-6} *7*
182.8775	2^-	46.84 *3*	0.80 *12*	136.0450	3^-	M1+E2	0.14 *4*	56 *6*	α(L)=42 *5*; α(M)=10.5 *13*; α(N+..)=3.7 *5* α(N)=2.9 *4*; α(O)=0.69 *8*; α(P)=0.131 *13*; α(Q)=0.00854 *14*
		95.7 *6*		86.6738	3^+				
		156.452 *2*	30.4 *16*	26.4266	3^+	E1		0.1784	α(K)=0.1379 *20*; α(L)=0.0305 *5*; α(M)=0.00744 *11*; α(N+..)=0.00256 *4* α(N)=0.00199 *3*; α(O)=0.000477 *7*; α(P)=8.54×10^{-5} *12*; α(Q)=4.49×10^{-6} *7*
		182.876 *2*	100 *12*	0.0	2^+	E1		0.1239	α(K)=0.0965 *14*; α(L)=0.0206 *3*; α(M)=0.00502 *7*; α(N+..)=0.001731 *25* α(N)=0.001346 *19*; α(O)=0.000323 *5*; α(P)=5.84×10^{-5} *9*; α(Q)=3.20×10^{-6} *5*
215.522	3^-	32.67 *3*	3.2 *5*	182.8775	2^-	M1(+E2)	≤0.025	136.4 *22*	α(L)=102.6 *17*; α(M)=25.0 *4*; α(N+..)=8.79 *15* α(N)=6.77 *11*; α(O)=1.67 *3*; α(P)=0.324 *5*; α(Q)=0.0251 *4*
		79.483 *17*	21 *4*	136.0450	3^-	E2(+M1)	≥4	41.7 *12*	α(L)=30.3 *9*; α(M)=8.44 *24*; α(N+..)=2.93 *8* α(N)=2.31 *7*; α(O)=0.537 *15*; α(P)=0.0882 *24*; α(Q)=0.00034 *5*
		153.192 *12*	53 *6*	62.330	4^+	(E1)		0.187	α(K)=0.1447 *21*; α(L)=0.0322 *5*; α(M)=0.00785 *11*; α(N+..)=0.00270 *4* α(N)=0.00210 *3*; α(O)=0.000503 *7*; α(P)=9.00×10^{-5} *13*; α(Q)=4.70×10^{-6} *7*
		189.099 *6*	54 *5*	26.4266	3^+	E1		0.1146	α(K)=0.0894 *13*; α(L)=0.0190 *3*; α(M)=0.00462 *7*; α(N+..)=0.001592 *23* α(N)=0.001238 *18*; α(O)=0.000297 *5*; α(P)=5.38×10^{-5} *8*; α(Q)=2.98×10^{-6} *5* I_γ: Iγ/Iγ(216γ)=0.46 *11* in α decay.
		215.517 *5*	100 *5*	0.0	2^+	E1		0.0847	α(K)=0.0664 *10*; α(L)=0.01376 *20*; α(M)=0.00334 *5*; α(N+..)=0.001154 *17* α(N)=0.000897 *13*; α(O)=0.000216 *3*; α(P)=3.94×10^{-5} *6*; α(Q)=2.25×10^{-6} *4*

$^{238}_{93}Np_{145}$-7

Adopted Levels, Gammas (continued)

γ(^{238}Np) (continued)

E$_i$(level)	J$^\pi_i$	E$_\gamma$[‡]	I$_\gamma$[#]	E$_f$	J$^\pi_f$	Mult.	δ[f]	α[†]	Comments
217.949	0$^-$	35.07 *3*	3.6 *8*	182.8775	2$^-$	E2		2.21×10^{3}	α(L)=1611 *24*; α(M)=446 *7*; α(N+..)=154.5 *23* α(N)=121.7 *18*; α(O)=28.3 *5*; α(P)=4.58 *7*; α(Q)=0.00987 *15*
		217.966 *20*	100	0.0	2$^+$	M2		10.57	α(K)=7.09 *10*; α(L)=2.56 *4*; α(M)=0.674 *10*; α(N+..)=0.241 *4* α(N)=0.186 *3*; α(O)=0.0456 *7*; α(P)=0.00865 *13*; α(Q)=0.000607 *9*
218.7	(6$^+$)	52.98[j]		165.532	5$^+$	M1+E2	0.17 *2*	40.1 *19*	α(L)=29.9 *14*; α(M)=7.5 *4*; α(N+..)=2.63 *14* α(N)=2.03 *11*; α(O)=0.494 *25*; α(P)=0.093 *4*; α(Q)=0.00589 *9*
232.828	5$^-$	53.70 *7*	20 *3*	179.154	4$^-$	M1+E2	0.271 *4*	48.3 *9*	α(L)=35.9 *7*; α(M)=9.20 *17*; α(N+..)=3.22 *6* α(N)=2.50 *5*; α(O)=0.601 *11*; α(P)=0.1092 *19*; α(Q)=0.00549 *8*
		96.82 *5*	17 *3*	136.0450	3$^-$	E2		16.87	α(L)=12.26 *18*; α(M)=3.42 *5*; α(N+..)=1.187 *17* α(N)=0.934 *14*; α(O)=0.218 *3*; α(P)=0.0358 *5*; α(Q)=0.0001386 *20*
		111.197 *15*	100 *21*	121.645	4$^+$	[E1]		0.0974	α(L)=0.0733 *11*; α(M)=0.0179 *3*; α(N+..)=0.00615 *9* α(N)=0.00480 *7*; α(O)=0.001138 *16*; α(P)=0.000199 *3*; α(Q)=9.45×10^{-6} *14*
243.959	(1)$^+$	243.959 *4*	100	0.0	2$^+$	M1+E2	0.10 *1*	1.93	α(K)=1.528 *22*; α(L)=0.302 *5*; α(M)=0.0733 *11*; α(N+..)=0.0257 *4* α(N)=0.0198 *3*; α(O)=0.00488 *7*; α(P)=0.000948 *14*; α(Q)=7.28×10^{-5} *11*
250.33	(1$^+$)	250.33[&] *3*	100[&]	0.0	2$^+$				
250.39	(2)$^-$	223.89 *10*	100	26.4266	3$^+$	(E1)		0.0776	α(K)=0.0609 *9*; α(L)=0.01254 *18*; α(M)=0.00304 *5*; α(N+..)=0.001052 *15* α(N)=0.000817 *12*; α(O)=0.000197 *3*; α(P)=3.60×10^{-5} *5*; α(Q)=2.07×10^{-6} *3*
		250.40[&] *4*	≤148[&]	0.0	2$^+$				
258.853	4$^-$	43.32 *3*	1.59 *24*	215.522	3$^-$	M1+E2	0.391 *20*	156 *9*	α(L)=115 *7*; α(M)=30.5 *19*; α(N+..)=10.6 *7* α(N)=8.3 *5*; α(O)=1.97 *12*; α(P)=0.339 *19*; α(Q)=0.00996 *17*
		75.97 *7*	2.2 *4*	182.8775	2$^-$	E2		52.9	α(L)=38.4 *6*; α(M)=10.71 *16*; α(N+..)=3.72 *6* α(N)=2.93 *5*; α(O)=0.681 *10*; α(P)=0.1115 *17*; α(Q)=0.000357 *6*
		122.76 *7*	6.6 *3*	136.0450	3$^-$	[M1]		13.43	α(K)=10.60 *15*; α(L)=2.13 *3*; α(M)=0.517 *8*; α(N+..)=0.182 *3* α(N)=0.1401 *20*; α(O)=0.0345 *5*; α(P)=0.00670 *10*; α(Q)=0.000519 *8*
		152.69[he] *3*	≤114[h]	106.155	5$^+$	[e]			
		196.46[@] *10*	17[@] *9*	62.330	4$^+$				
		232.433 *8*	100 *17*	26.4266	3$^+$	E1		0.0712	α(K)=0.0560 *8*; α(L)=0.01145 *16*; α(M)=0.00278 *4*;

γ(^{238}Np) (continued)

E_i(level)	J^π_i	E_γ[‡]	I_γ[#]	E_f	J^π_f	Mult.	δ[f]	α[†]	Comments
									α(N+..)=0.000961 *14* α(N)=0.000746 *11*; α(O)=0.000180 *3*; α(P)=3.29×10^{-5} *5*; α(Q)=1.92×10^{-6} *3*
275.519	5$^+$	153.870 *9*	100	121.645	4$^+$	M1+E2		4.7 *25*	α(K)=3 *3*; α(L)=1.30 *19*; α(M)=0.34 *7*; α(N+..)=0.119 *24* α(N)=0.093 *20*; α(O)=0.022 *4*; α(P)=0.0039 *5*; α(Q)=0.00015 *13*
277.641	(2)$^+$	251.25 *4*	61 *15*	26.4266	3$^+$	E2+(M1)	≥4.6	0.39 *4*	α(K)=0.13 *3*; α(L)=0.184 *4*; α(M)=0.0504 *9*; α(N+..)=0.0176 *3* α(N)=0.01375 *22*; α(O)=0.00324 *6*; α(P)=0.000554 *11*; α(Q)=8.9×10^{-6} *14*
		277.633 *19*	100	0.0	2$^+$				
297.03	(6$^-$)	131.49 *8*	100	165.532	5$^+$				
		190.88 *5*	39 *22*	106.155	5$^+$				
298.368	3$^+$	54.40 *4*	0.66 *10*	243.959	(1)$^+$	E2		262	α(L)=190 *3*; α(M)=52.9 *8*; α(N+..)=18.4 *3* α(N)=14.45 *21*; α(O)=3.36 *5*; α(P)=0.548 *8*; α(Q)=0.001445 *21*
		236.025 *11*	100 *8*	62.330	4$^+$	M1		2.13	α(K)=1.691 *24*; α(L)=0.332 *5*; α(M)=0.0806 *12*; α(N+..)=0.0283 *4* α(N)=0.0218 *3*; α(O)=0.00537 *8*; α(P)=0.001043 *15*; α(Q)=8.06×10^{-5} *12*
		271.953 *11*	72 *5*	26.4266	3$^+$	M1		1.437	α(K)=1.140 *16*; α(L)=0.224 *4*; α(M)=0.0542 *8*; α(N+..)=0.0190 *3* α(N)=0.01467 *21*; α(O)=0.00361 *5*; α(P)=0.000702 *10*; α(Q)=5.42×10^{-5} *8*
		298.38 *4*	9.2 *10*	0.0	2$^+$	M1		1.111	α(K)=0.882 *13*; α(L)=0.1727 *25*; α(M)=0.0418 *6*; α(N+..)=0.01470 *21* α(N)=0.01133 *16*; α(O)=0.00279 *4*; α(P)=0.000542 *8*; α(Q)=4.18×10^{-5} *6*
299.23	(3$^+$)	237.02 *10*	100 *5*	62.330	4$^+$				
		272.75 *7*	81 *18*	26.4266	3$^+$				
		299.20 *14*	60 *30*	0.0	2$^+$				
299.788	(1)$^-$	116.90 *2*	100	182.8775	2$^-$				
300.68	1$^-$,2,3,4$^-$	84.9 *2*		215.522	3$^-$				
		117.2[g] *6*		182.8775	2$^-$				
		164.67 *7*		136.0450	3$^-$				
300.743	(6$^-$)	67.93 *3*	59 *5*	232.828	5$^-$				
		121.3 *6*		179.154	4$^-$				
		135.19 *2*	100 *6*	165.532	5$^+$				
		139.05 *2*	≤2.1	161.685	6$^+$				
		194.61 *2*	21.0 *7*	106.155	5$^+$				
312.704	5$^-$	53.88 *4*	10.0 *18*	258.853	4$^-$	M1+E2	0.22 *4*	42 *5*	α(L)=32 *3*; α(M)=8.0 *9*; α(N+..)=2.8 *3* α(N)=2.17 *24*; α(O)=0.52 *6*; α(P)=0.097 *9*; α(Q)=0.00553 *11*
		97.22 *5*	32 *4*	215.522	3$^-$	E2		16.54	α(L)=12.03 *17*; α(M)=3.35 *5*; α(N+..)=1.165 *17*

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$\gamma(^{238}Np)$ (continued)

E_i(level)	J^π_i	E_γ[‡]	I_γ[#]	E_f	J^π_f	Mult.	δ[f]	α[†]	Comments
									α(N)=0.916 *13*; α(O)=0.213 *3*; α(P)=0.0351 *5*; α(Q)=0.0001365 *20*
312.704	5^-	151.07 *5*	≈300	161.685	6^+			16.7	E_γ,I_γ: seen only in α decay and placed by the authors from the 313 level. The placement is perhaps questionable since Iγ/Iγ(176γ)=3.0 *16* in α decay, and this ratio for (n,γ) would give Iγ(151γ)=0.5 *3* per 100 neutron captures, an intensity large enough for the γ line to have been seen.
		176.62 *5*	100 *18*	136.0450	3^-				
		250.36[&] *3*	≤241[&]	62.330	4^+				
315.063	4^+,5^+	82.232 *4*	100 *14*	232.828	5^-	E1+M2	0.024 *+6−7*	0.32 *6*	α(L)=0.24 *5*; α(M)=0.061 *13*; α(N+..)=0.021 *5* α(N)=0.017 *4*; α(O)=0.0040 *9*; α(P)=0.00070 *16*; α(Q)=3.6×10^{-5} *10*
		135.918 *7*	35 *5*	179.154	4^-				
		179.00 *3*	33 *7*	136.0450	3^-				
324.314	$(4)^-$	108.792 *7*	100	215.522	3^-				
325.210	1^-	107.263 *6*	100	217.949	0^-	M1		4.18	α(L)=3.15 *5*; α(M)=0.763 *11*; α(N+..)=0.268 *4* α(N)=0.207 *3*; α(O)=0.0509 *8*; α(P)=0.00990 *14*; α(Q)=0.000767 *11*
		142.328 *10*	68 *20*	182.8775	2^-				
328.6	6^+	163.25[dj] *2*	[d]	165.532	5^+	[d]			
342.439	5^-	66.919 *5*	97 *3*	275.519	5^+	E1		0.368	α(L)=0.277 *4*; α(M)=0.0684 *10*; α(N+..)=0.0232 *4* α(N)=0.0182 *3*; α(O)=0.00425 *6*; α(P)=0.000709 *10*; α(Q)=2.82×10^{-5} *4*
		109.614[ic] *4*	≤120[ic]	232.828	5^-	[c]			
		163.26[d] *2*	100[d] *6*	179.154	4^-	M1+E2[d]	6.26 *7*	1.86	α(K)=0.310 *5*; α(L)=1.131 *16*; α(M)=0.313 *5*; α(N+..)=0.1090 *16* α(N)=0.0856 *12*; α(O)=0.0200 *3*; α(P)=0.00335 *5*; α(Q)=2.93×10^{-5} *5*
		206.37[@] *2*	10.2[@] *12*	136.0450	3^-				
352.46	$(3)^-$	52.60 *5*	1.8 *5*	299.788	$(1)^-$				Mult.: 1990Ho02 assign mult=E2 in (n,γ), and the placement requires ΔJ=2, Δπ=no; however, the ce ratios suggest an M1 component. One gets δ=1.44 *8*, 0.27 *3*, and 0.93 *7* from L1/L2, L3/L2, and M1/M2, respectively. M3/M2 gives δ>0.25.
		93.67 *5*	100	258.853	4^-				
367.26	$(2)^-$	184.38 *3*	100	182.8775	2^-				
373.684	$(1)^-$	48.50 *3*	5.0 *10*	325.210	1^-	(M1)		42.3	α(L)=31.8 *5*; α(M)=7.74 *11*; α(N+..)=2.72 *4* α(N)=2.10 *3*; α(O)=0.517 *8*; α(P)=0.1003 *15*; α(Q)=0.00781 *11*
		155.731 *11*	100	217.949	0^-				
376.70	(6^-)	117.8 *6*		258.853	4^-				
		270.55 *6*		106.155	5^+				

γ(^{238}Np) (continued)

E_i(level)	J^π_i	E_γ[‡]	I_γ[#]	E_f	J^π_f	Mult.	δ[f]	α[†]	Comments
380.60	(3)$^-$	130.215 *12*		250.39	(2)$^-$	E2(+M1)	≥7.9	4.56 *9*	α(K)=0.27 *7*; α(L)=3.12 *5*; α(M)=0.867 *13*; α(N+..)=0.302 *5* α(N)=0.237 *4*; α(O)=0.0553 *8*; α(P)=0.00918 *14*; α(Q)=5.2×10^{-5} *4*
389.4	7$^+$	113.7 *6*		275.519	5$^+$				
		170.50 *1*		218.7	(6$^+$)				
395.198	(5)$^+$	289.04 *8*	67 *15*	106.155	5$^+$	M1+E2	0.9 *3*	0.77 *19*	α(K)=0.57 *17*; α(L)=0.151 *16*; α(M)=0.038 *4*; α(N+..)=0.0133 *12* α(N)=0.0103 *9*; α(O)=0.00250 *23*; α(P)=0.00047 *6*; α(Q)=2.8×10^{-5} *8*
		332.868 *16*	100	62.330	4$^+$	E2(+M1)	≥5.9	0.155 *10*	α(K)=0.071 *9*; α(L)=0.0617 *13*; α(M)=0.0166 *3*; α(N+..)=0.00580 *11* α(N)=0.00454 *9*; α(O)=0.001073 *21*; α(P)=0.000187 *4*; α(Q)=4.2×10^{-6} *4*
407.59	6$^-$	132.6 *6*		275.519	5$^+$				
		174.76 *6*		232.828	5$^-$				
417.641	2$^+$,3$^+$,4$^+$	295.984 *15*	100 *8*	121.645	4$^+$	E2		0.208	α(K)=0.0780 *11*; α(L)=0.0950 *14*; α(M)=0.0259 *4*; α(N+..)=0.00902 *13* α(N)=0.00707 *10*; α(O)=0.001665 *24*; α(P)=0.000286 *4*; α(Q)=5.03×10^{-6} *7*
		330.966 *19*	46 *13*	86.6738	3$^+$				
		391.27 *3*	59 *5*	26.4266	3$^+$	M1+E2	1.34 *+26−19*	0.25 *4*	α(K)=0.18 *3*; α(L)=0.051 *4*; α(M)=0.0129 *9*; α(N+..)=0.0045 *3* α(N)=0.00350 *23*; α(O)=0.00085 *6*; α(P)=0.000157 *12*; α(Q)=8.8×10^{-6} *14*
		417.60[hb] *6*	≤4.9[h]	0.0	2$^+$	[b]			
433.716	3$^+$,4$^+$	174.88 *3*	23 *17*	258.853	4$^-$	E1		0.1375	α(K)=0.1069 *15*; α(L)=0.0231 *4*; α(M)=0.00561 *8*; α(N+..)=0.00193 *3* α(N)=0.001506 *21*; α(O)=0.000361 *5*; α(P)=6.51×10^{-5} *10*; α(Q)=3.52×10^{-6} *5*
		218.17 *3*	42 *8*	215.522	3$^-$				
		297.672 *15*	100 *12*	136.0450	3$^-$	E1		0.0410	α(K)=0.0325 *5*; α(L)=0.00638 *9*; α(M)=0.001544 *22*; α(N+..)=0.000535 *8* α(N)=0.000415 *6*; α(O)=0.0001003 *14*; α(P)=1.86×10^{-5} *3*; α(Q)=1.144×10^{-6} *16*
442.23	(4)$^-$	74.975 *2*		367.26	(2)$^-$				
459.6	(6$^+$)	117.2[g] *6*		342.439	5$^-$				
497.20	2$^-$,3$^-$,4$^-$	281.79 *10*	100	215.522	3$^-$	M1+E2	1.0 *+5−3*	0.77 *21*	α(K)=0.56 *19*; α(L)=0.159 *17*; α(M)=0.040 *4*; α(N+..)=0.0141 *13* α(N)=0.0109 *10*; α(O)=0.00265 *25*; α(P)=0.00049 *6*; α(Q)=2.7×10^{-5} *9*
		314.31[ha] *3*	≤176[h]	182.8775	2$^-$	[a]			

$^{238}_{93}$Np$_{145}$-11

$\gamma(^{238}Np)$ (continued)

E_i(level)	J^π_i	E_γ[‡]	I_γ[#]	E_f	J^π_f	Mult.	δ[f]	α[†]	Comments
523.83	3+,4+,5+	358.25 4	79 7	165.532	5+				
		417.60[hb] 6	≤7.2[h]	106.155	5+	[b]			
		461.59 9	84 14	62.330	4+	M1+E2	0.93 +25−20	0.21 4	α(K)=0.16 3; α(L)=0.037 4; α(M)=0.0091 9; α(N+..)=0.0032 4 α(N)=0.00247 25; α(O)=0.00060 6; α(P)=0.000114 13; α(Q)=7.6×10^{-6} 13
		497.49 5	100 9	26.4266	3+				
529.857	3−	217.26 7	100 10	312.704	5−	E2		0.589	α(K)=0.1340 19; α(L)=0.332 5; α(M)=0.0915 13; α(N+..)=0.0319 5 α(N)=0.0250 4; α(O)=0.00586 9; α(P)=0.000991 14; α(Q)=1.090×10^{-5} 16
		314.31[ha] 3	≤70[h]	215.522	3−	[a]			
		346.98 1	37 10	182.8775	2−	M1+E2	0.7 4	0.53 15	α(K)=0.41 13; α(L)=0.093 16; α(M)=0.023 4; α(N+..)=0.0081 12 α(N)=0.0063 9; α(O)=0.00153 23; α(P)=0.00029 5; α(Q)=2.0×10^{-5} 6
543.24	3−,4−	310.40 8	9 5	232.828	5−				
		364.09 4	100	179.154	4−				
567.023	3−	334.205 13	42 12	232.828	5−	E2		0.1441	α(K)=0.0624 9; α(L)=0.0598 9; α(M)=0.01620 23; α(N+..)=0.00565 8 α(N)=0.00442 7; α(O)=0.001044 15; α(P)=0.000181 3; α(Q)=3.78×10^{-6} 6
		351.37 8	52 8	215.522	3−	E2		0.1247	α(K)=0.0569 8; α(L)=0.0497 7; α(M)=0.01342 19; α(N+..)=0.00468 7 α(N)=0.00366 6; α(O)=0.000865 13; α(P)=0.0001505 22; α(Q)=3.38×10^{-6} 5
		384.12 4	29 3	182.8775	2−	M1+E2	0.93 16	0.34 5	α(K)=0.26 4; α(L)=0.063 5; α(M)=0.0156 11; α(N+..)=0.0055 4 α(N)=0.0042 3; α(O)=0.00103 8; α(P)=0.000195 15; α(Q)=1.24×10^{-5} 17
		430.96 3	100 12	136.0450	3−	M1+E2	0.87 22	0.26 5	α(K)=0.20 4; α(L)=0.046 6; α(M)=0.0114 12; α(N+..)=0.0040 5 α(N)=0.0031 4; α(O)=0.00076 8; α(P)=0.000144 17; α(Q)=9.6×10^{-6} 18
646.76	2+,3+,(4)+	584.47 5	63 16	62.330	4+				
		620.28 6	100 13	26.4266	3+	M1+E2	0.97 21	0.093 15	α(K)=0.072 12; α(L)=0.0157 19; α(M)=0.0039 5; α(N+..)=0.00136 16 α(N)=0.00105 12; α(O)=0.00026 3; α(P)=4.9×10^{-5} 6; α(Q)=3.4×10^{-6} 6
		646.75 7	87 8	0.0	2+	E2(+M1)	≥1.9	0.040 12	α(K)=0.029 10; α(L)=0.0083 16; α(M)=0.0021 4; α(N+..)=0.00074 13

$^{238}_{93}Np_{145}$-12

γ(^{238}Np) (continued)

E_i(level)	E_γ‡	Comments
		α(N)=0.00057 *10*; α(O)=0.000139 *25*; α(P)=2.6×10^{-5} *5*; α(Q)=1.4×10^{-6} *5*

† Additional information 2.
‡ From (n,γ) and α decay. No details are available as to the γ energy involved in the measurement.
# Branching ratios are from (n,γ), except where from α decay as noted, or where the level is populated only in α decay.
@ From α decay. Not seen in (n,γ).
& From (n,γ) one has Eγ=250.40 *4* with mult=E1 or E2, doubly placed from the 250.39 and 313 levels, and from α decay one has Eγ=250.33 *3* doubly placed from the 250.32 and 313 levels. All placements involve $\Delta\pi$=yes, except for the 250.39 level. The evaluators adopt a weighted average of 250.36 *3* for placement from the 313 level, and the branchings for all placements are upper limits.
[a] From (n,γ) one has Eγ=314.31 *3* with mult=M1+E2 doubly placed from the 497 and 530 levels. Both placements involve $\Delta\pi$=no.
[b] In (n,γ) one has Eγ=417.60 *6* with mult=M1 doubly placed from the 418 and 524 levels. Both placements involve $\Delta\pi$=no.
[c] In (n,γ) one has Eγ=109.614 *4* with mult mainly E1 doubly placed from the 136 and 342 levels. The transition is also seen in α decay. From a comparison of the branchings in (n,γ) and α decay the intensity can be divided between the two placements. Most of the intensity belongs with the 136 level, and mult=E1 can be assigned to this placement. Placement from the 342 level involves $\Delta\pi$=no.
[d] In α decay one has Eγ=163.25 *2* doubly placed from the 329 and 342 levels. Eγ=163.29 *5* is reported in (n,γ) with mult=M1+E2, and placed from the 342 level only. From a comparison of branchings from the two sources, all the intensity of the 163γ in α decay can be accounted for by placement from the 342 level.
[e] In (n,γ) one has Eγ=152.69 *3* with tentative mult=E1 doubly placed from the 179 and 259 levels. The same transition is also seen in α decay with the same placements. Both placements involve $\Delta\pi$=yes.
[f] From ^{237}Np(n,γ) E=th.
[g] Multiply placed.
[h] Multiply placed with undivided intensity.
[i] Multiply placed with intensity suitably divided.
[j] Placement of transition in the level scheme is uncertain.

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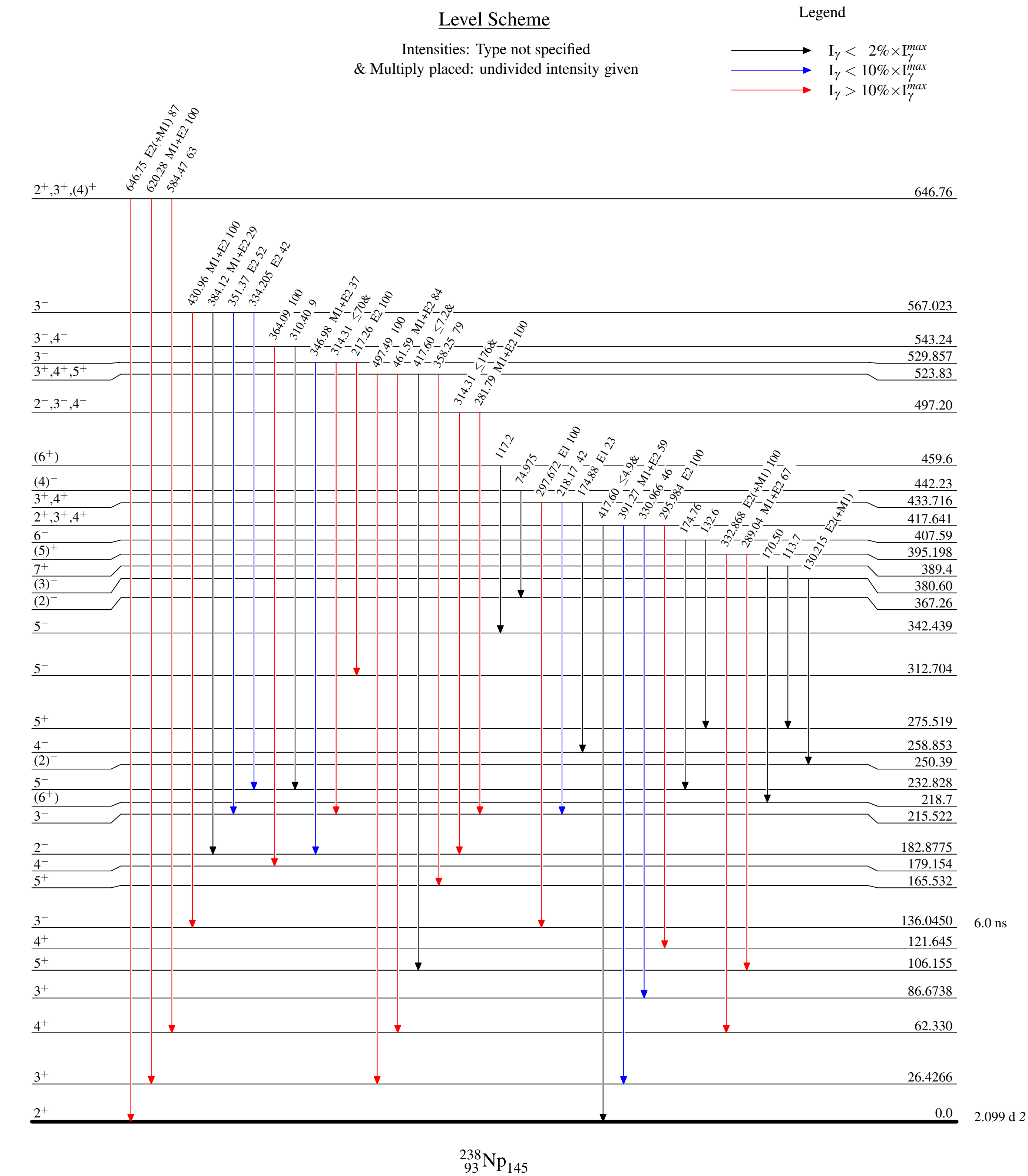
Adopted Levels, Gammas

Level Scheme

Intensities: Type not specified
& Multiply placed: undivided intensity given



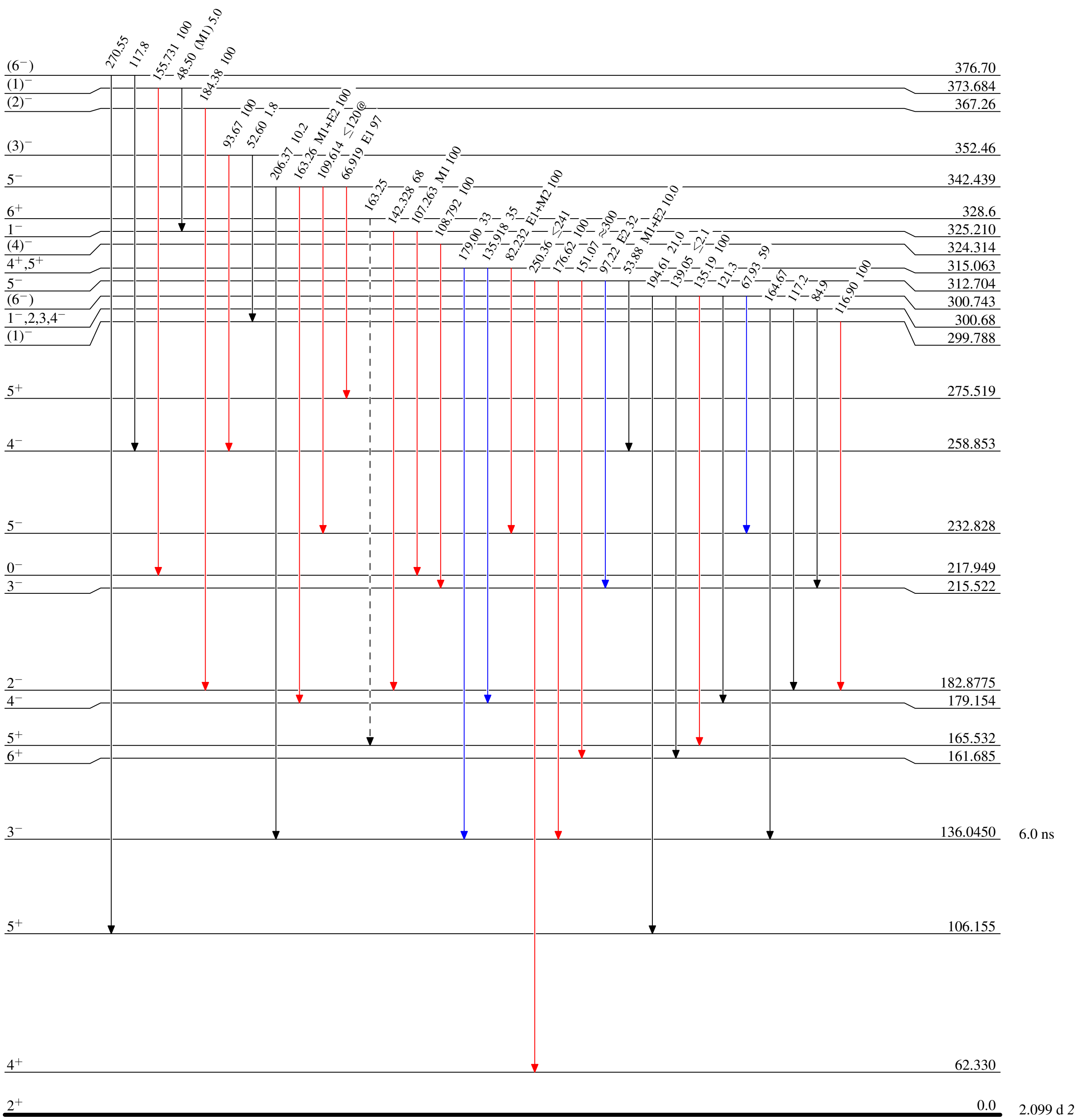
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

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)

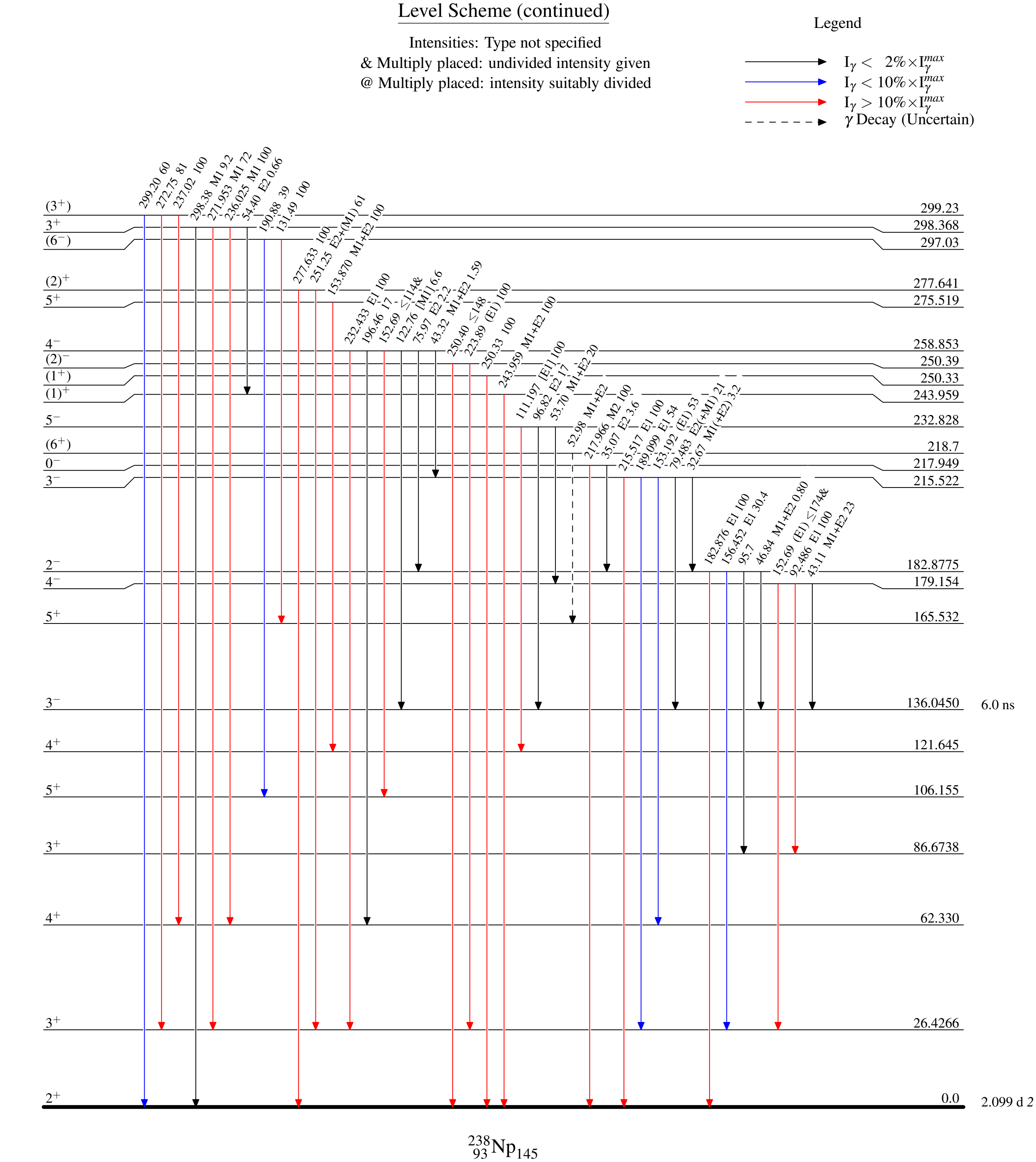


$^{238}_{93}Np_{145}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided



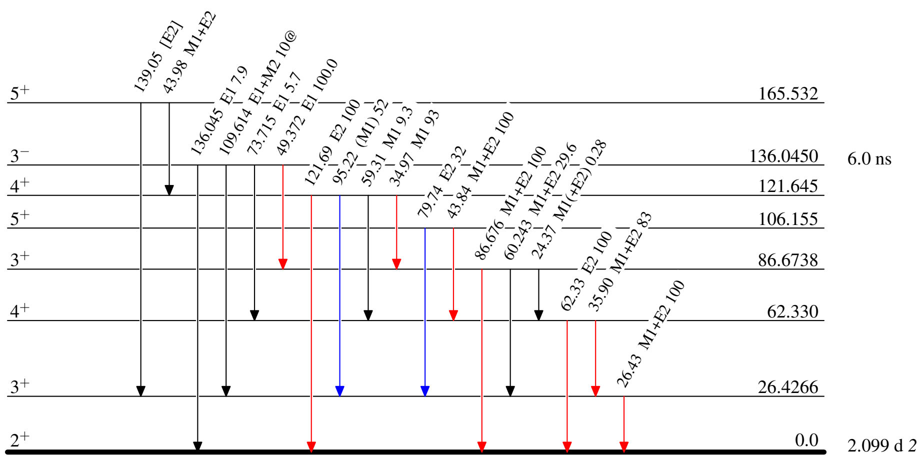
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

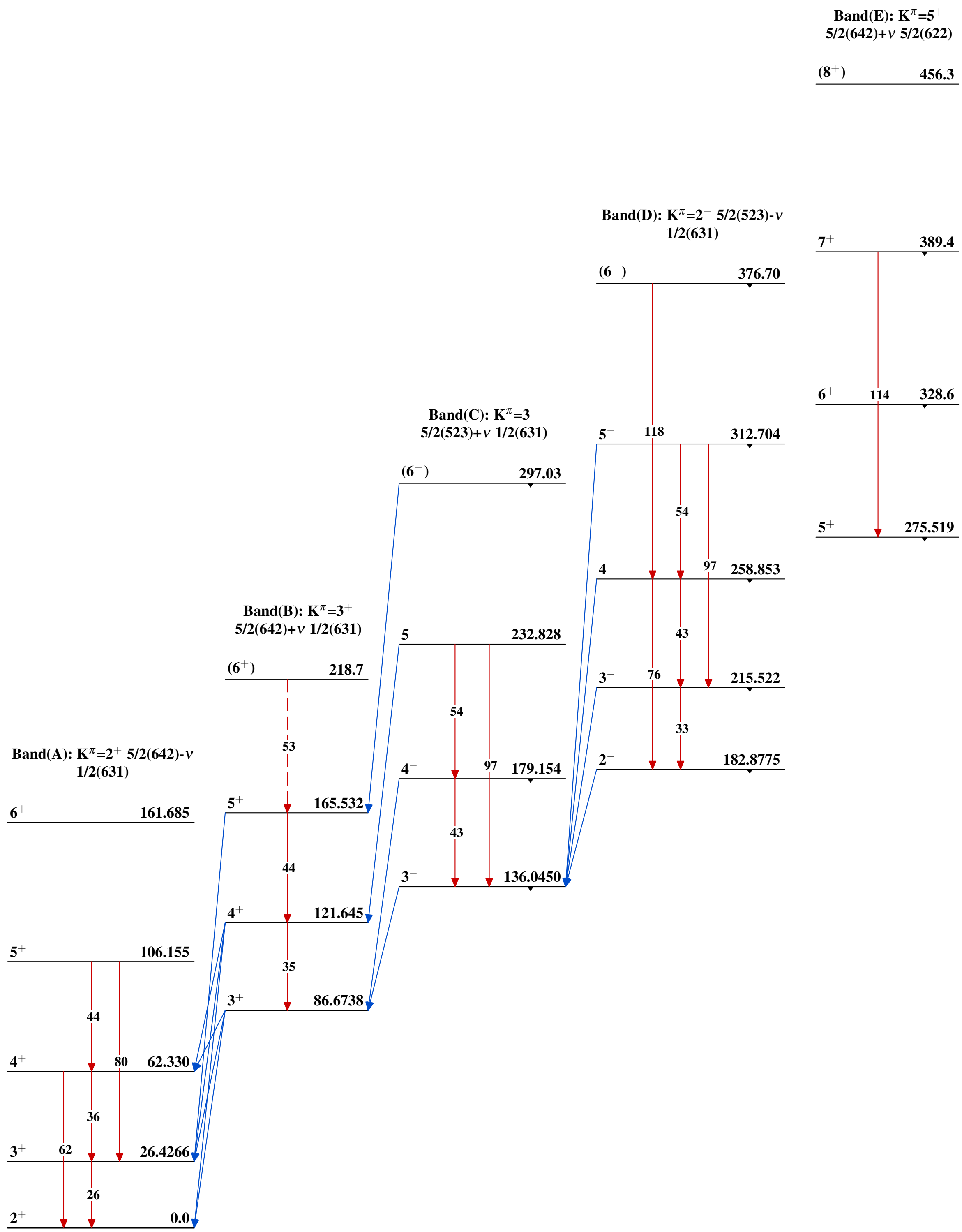
Legend

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



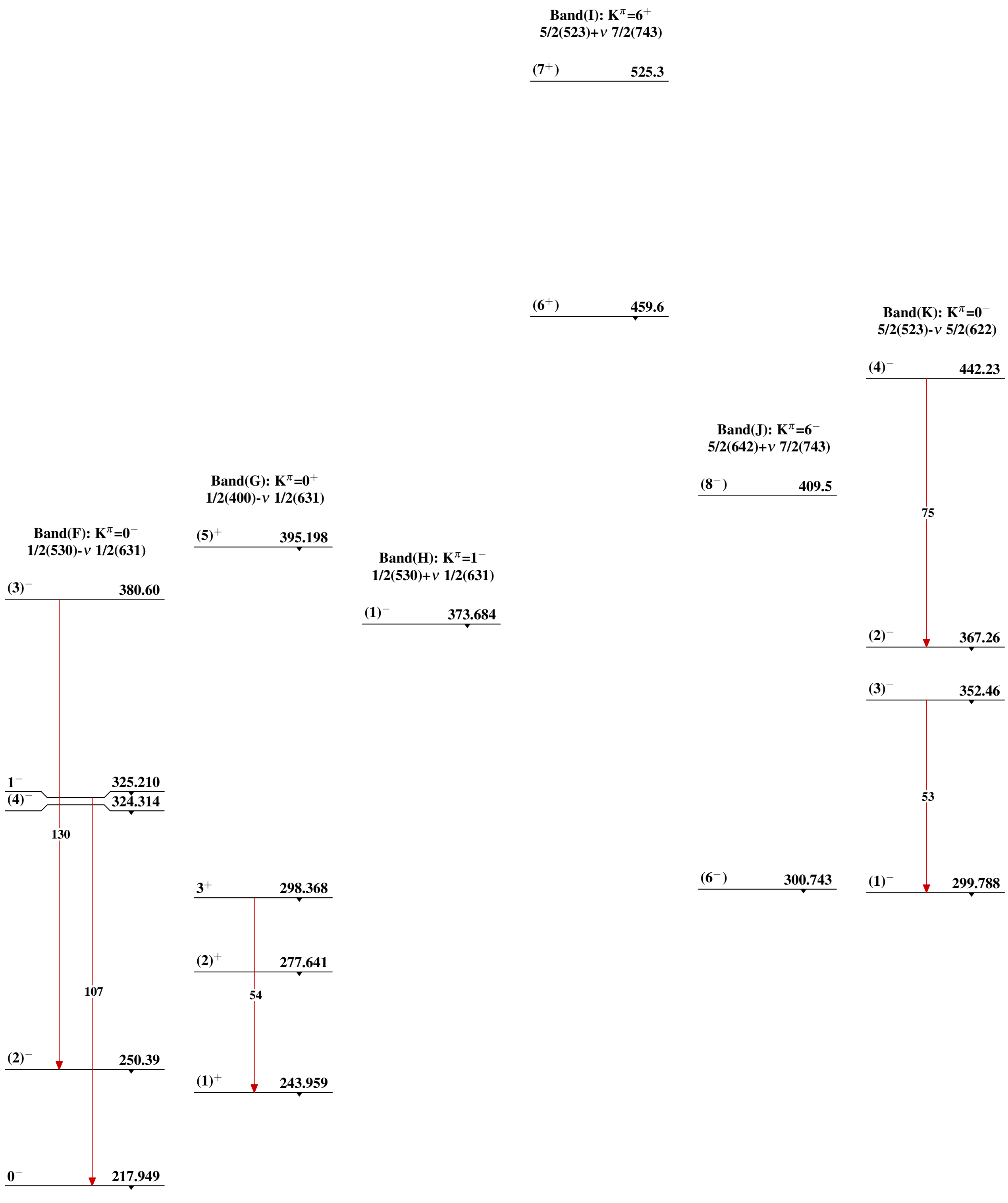
$^{238}_{93}Np_{145}$

Adopted Levels, Gammas



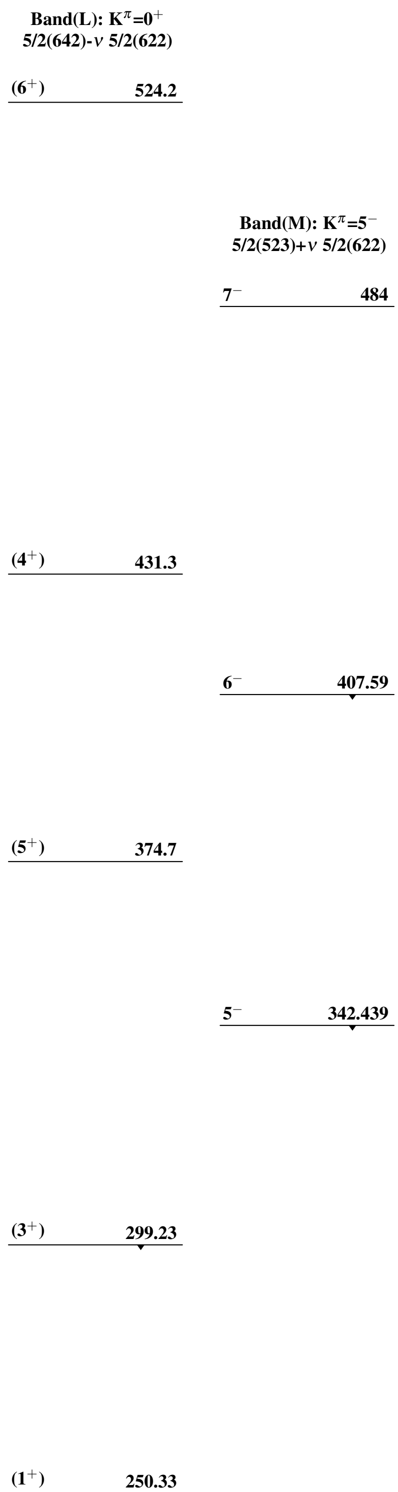
$^{238}_{93}Np_{145}$

Adopted Levels, Gammas (continued)



$^{238}_{93}Np_{145}$

Adopted Levels, Gammas (continued)



$^{238}_{93}Np_{145}$