Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 154, 1 (2018)	20-Nov-2018

Q(β^-)=−5200 *60*; S(n)=9660 *50*; S(p)=1890 *50*; Q(α)=1760 *90* 2017Wa10
Q(εp)=3230 *50* (2017Wa10).

^{140}Eu Levels

Because of important differences between 2003He25 (^{92}Mo(^{51}V,2pnγ)), 2002Cu05 (^{107}Ag(^{36}Ar,n2pγ)), and E(level),J^π values adopted here (see footnote on 459.5+x,(8$^+$)), the band heads, spins, and signatures adopted for the positive parity bands differ from those in these reaction datasets. See band footnotes and XREF′s for specific comments and changes.

Cross Reference (XREF) Flags

A	^{140}Eu IT decay	D	^{92}Mo(^{54}Fe,n5pγ), (^{52}Cr,n3pγ)
B	^{140}Gd ε decay	E	^{107}Ag(^{36}Ar,n2pγ)
C	^{92}Mo(^{51}V,2pnγ)		

E(level)	J^π	$T_{1/2}$	XREF	Comments
0.0	1$^+$	1.51 s *2*	AB D	%ε+%β^+=100 μ=+1.365 *13* (2012StZZ) Q=+0.31 *4* (2014StZZ) J^π: log *ft*=4.4 to 0$^+$. $T_{1/2}$: from 1991Fi03. Others: 1.54 s *13* (1987De04); 1.3 s *2* (1973WeZK,1972WeZE). Configuration=$\pi d_{5/2}\otimes\nu d_{3/2}$ (2006Ta08). μ: By collinear fast beam laser spectroscopy − accelerated beam (1985Ah02). Q: By collinear fast beam laser spectroscopy − accelerated beam (1985Ah02). RMS charge radius $<r^2>^{1/2}$=4.9695 fm *91* (2013An02).
174.59 *9*	2$^+$		AB D	J^π: γ to 1$^+$ is M1, ΔJ=1.
185.3 *3*	3$^+$		AB D	J^π: γ to 1$^+$ is E2, ΔJ=2.
191.24 *8*			B	
0+x#	(5$^-$)	125 ms *2*	A CDE	%IT=100; %ε+%β^+<1 (1991Fi03) Additional information 1. $T_{1/2}$: from 1991Fi03. E(level): x=210 *15* (2012Au07); other value x=210 *25* (≈50 keV above the 185.3 level, from absence of K x ray corresponding to an isomeric transition, 1991Fi03). J^π: γ to 2$^+$ is (E3), γ to 3$^+$ is (M2); systematic behavior of 5$^-$ and 8$^+$ levels in ^{140}Eu, ^{142}Tb, and ^{144}Ho N=77 isotones with unambiguously measured 5$^-$ in ^{142}Tb (2006Ta08).
361.3 *4*			B	
170.41+x‡ *20*	(6$^-$)		CDE	J^π: γ to (5$^-$) is M1+E2, ΔJ=1 transition (in between signature-partner bands).
379.00 *10*			B	
417.72 *10*			B	
427.92 *10*			B	
446.98 *13*			B	
453.25 *11*			B	
284.82+x@ *20*	(6$^-$)		CD	J^π: γ to (5$^-$) is M1+E2, ΔJ=1 transition (in between rotational bands).
488.1 *4*			B	
535.7 *4*			B	
546.54 *15*			B	
361.48+x# *20*	(7$^-$)		CDE	J^π: γ to (5$^-$) is E2, in-band ΔJ=2 transition; γ to 170.41+x, (6$^-$) is M1+E2, ΔJ=1

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Adopted Levels, Gammas (continued)

^{140}Eu Levels (continued)

E(level)	J^π	$T_{1/2}$	XREF	Comments
				transition (in between signature-partner bands).
389.27+x *23*	(7⁻)		D	J^π: γ to 284.82+x, (6⁻) is (M1+E2); γ to (5⁻) is (E2).
610.99 *22*			B	
422.42+x *19*	(7⁻)		DE	J^π: γ to 170.41+x, (6⁻) is M1+E2.
459.5+x[†] *3*	(8⁺)[†]	299.8 ns *21*	CDE	XREF: C(0+Y). J^π: γ's to 422.42+x, (7⁻) and 361.48+x, (7⁻) are E1. $T_{1/2}$: weighted average of 302 ns *4* (^{92}Mo(^{54}Fe,n5pγ), 2006Ta08) and 299.0 ns *25* (^{107}Ag(^{36}Ar,n2pγ), 2002Cu05). Configuration=$\pi h_{11/2}\otimes\nu h_{11/2}$.
687.04 *22*			B	
513.0+x *6*	(7⁺)		C	XREF: C(53.5+Y). J^π: γ from (8⁺) is (M1+E2), ΔJ=1.
530.5+x[&] *4*	(9⁺)		C	XREF: C(71.00+Y). J^π: γ to (8⁺) is (M1+E2), ΔJ=1.
722.28 *9*			B	
749.94 *8*	1⁺		B	J^π: log *ft*=4.6 from 0⁺.
607.9+x[b] *5*	(8⁺)		C	XREF: C(148.4+Y). J^π: γ from (10⁺) is E2, ΔJ=2 in-band transition.
654.80+x[‡] *24*	(8⁻)		C	J^π: γ to 170.41+x, 6⁻ is E2, in-band ΔJ=2 transition; γ to 361.48+x, (7⁻) is M1+E2, ΔJ=1 transition (in between signature-partner bands).
882.69 *22*			B	
762.90+x[@] *24*	(8⁻)		C	J^π: γ to 284.82+x, (6⁻) is E2, in-band ΔJ=2 transition; γ to 361.48+x, (7⁻) is M1+E2, ΔJ=1 transition (in between rotational bands).
1077.8 *4*			B	
896.4+x[a] *4*	(10⁺)		C E	XREF: C(436.9+Y)E(825.1+X). J^π: γ to (9⁺) is M1+E2, ΔJ=1 transition (in between signature-partner bands).
898.88+x[#] *22*	(9⁻)		C E	J^π: γ to 361.48+x, (7⁻) is E2, in-band ΔJ=2 transition; γ to 654.80+x, (8⁻) is M1+E2, ΔJ=1 transition (in between signature-partner bands).
1092.6 *10*			B	
1131.1 *3*			B	
994.0+x[c] *6*	(10⁺)		C	XREF: C(534.5+Y). J^π: γ to (8⁺) is E2, ΔJ=2 transition.
1014.5+x[b] *5*	(10⁺)		C	XREF: C(555.0+Y). J^π: γ to (8⁺) is E2, in-band ΔJ=2 transition; γ to (9⁺) is M1+E2, ΔJ=1 transition (in between rotational bands).
1215.99 *22*			B	
1171.1+x[&] *4*	(11⁺)		C E	XREF: C(711.56+Y)E(1100.0+X). J^π: γ to (9⁺) is E2, in-band ΔJ=2 transition; γ to (10⁺) is M1+E2, ΔJ=1 transition (in between signature-partner bands).
1364.6+x[@] *3*	(10⁻)		C	J^π: γ to 762.90+x, (8⁻) is E2, in-band ΔJ=2 transition; γ to 654.80+x, (8⁻) is E2, ΔJ=2 transition (in between rotational bands).
1376.5+x[‡] *4*	(10⁻)		C	J^π: γ to 654.80+x, (8⁻) is E2, in-band ΔJ=2 transition.
1603.8+x[c] *7*	(12⁺)		C	XREF: C(1144.3+Y). J^π: γ to (10⁺) is E2, in-band ΔJ=2 transition.
1614.5+x[#] *3*	(11⁻)		C	J^π: γ to (9⁻) is E2, in-band ΔJ=2 transition.
1617.1+x[a] *4*	(12⁺)		C E	XREF: C(1157.53+Y)E(1545.7). J^π: γ to (10⁺) is E2, in-band ΔJ=2 transition; γ to (11⁺) is M1+E2, ΔJ=1 transition (in between signature-partner bands).
1661.6+x[b] *4*	(12⁺)		C	XREF: C(1202.0+Y). J^π: γ to (11⁺) is M1+E2, ΔJ=1 transition (in between rotational bands).
1959.9+x *5*	(12⁻)		C	J^π: γ to (11⁻) is M1+E2, ΔJ=1 transition (in between signature-partner bands).
1978.3+x[&] *4*	(13⁺)		C E	XREF: C(1518.8+Y)E(1907.1+X).

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Adopted Levels, Gammas (continued)

^{140}Eu Levels (continued)

E(level)	J^π	XREF	Comments
			J^π: γ to (11^+) is E2, in-band ΔJ=2 transition; γ to (12^+) is M1+E2, ΔJ=1 transition (in between signature-partner bands).
2169.8+x *4*	(12^-)	C	J^π: γ to 1364.6+x, (10^-) is E2, ΔJ=2 transition.
2197.3+x[@] *4*	(12^-)	C	J^π: γ to 1376.5+x, (10^-) is E2, in-band ΔJ=2 transition.
2223.1+x[c] *8*	(14^+)	C	XREF: C(1763.6+Y). J^π: γ to (12^+) is E2, in-band ΔJ=2 transition.
2427.7+x[@] *4*	(13^-)	C	J^π: both γ's to (12^-), 2197.3+x and 2169.8+x are M1+E2, ΔJ=1.
2444.5+x[#] *5*	(13^-)	C E	J^π: γ to 1614.5+x, (11^-) is E2, in-band ΔJ=2 transition.
2448.9+x[a] *4*	(14^+)	C E	XREF: C(1989.3+Y)E(2377.1+X). J^π: γ to (12^+) is E2, in-band ΔJ=2 transition; γ to (13^+) is M1+E2, ΔJ=1 transition (in between signature-partner bands).
2479.9+x[b] *5*	(14^+)	C	XREF: C(2020.4+Y). J^π: γ to (12^+) is E2, in-band ΔJ=2 transition; γ to (13^+) is M1+E2, ΔJ=1 transition (in between rotational bands).
2597.7+x[@] *4*	(14^-)	C	J^π: γ to 2427.7+x, (13^-) is supposed to be (M1+E2), ΔJ=1 transition, based on band crossing at spin 12.
2842.4+x[c] *8*	(16^+)	C	XREF: C(2382.9+Y).
2884.9+x *6*	(14^-)	C	J^π: γ to 1959.9+x, (12^-) is E2, in-band ΔJ=2 transition.
2898.4+x[&] *5*	(15^+)	C E	XREF: C(2438.8+Y)E(2826.8+X). J^π: γ to (13^+) is E2, in-band ΔJ=2 transition.
2959.8+x[a] *5*	(16^+)	C E	XREF: C(2500.2+Y)E(2887.6+X). J^π: γ to (14^+) is (E2), in-band ΔJ=2 transition.
2970.6+x[@] *5*	(15^-)	C	J^π: γ to 2597.7+x, (14^-) is M1+E2, in-band ΔJ=1 transition.
3096.0+x[b] *5*	(16^+)	C	XREF: C(2636.4+Y). J^π: (highest) level in ΔJ=2 band, γ to 2479.9+x, (14^+).
3287.5+x[#] *11*	(15^-)	E	J^π: (highest) level in ΔJ=2 band, γ to 2444.5+x (13^-).
3424.5+x[@] *5*	(16^-)	C	J^π: γ to (15^-) is M1+E2, in-band ΔJ=1 transition.
3583.5+x *7*	(17^-)	C	J^π: γ to (15^-) is (E2).
3607.5+x[a] *5*	(18^+)	C E	XREF: C(3147.9+Y)E(3534.1+X). J^π: γ to (16^+) is E2, in-band ΔJ=2 transition.
3790.9+x? *5*		C	E(level),J^π: questionable level because uncertain placement of its daughter γ in (^{51}V,2pnγ) (2003He25); 2003He25 assign $J^\pi=17^-$ with no argument.
3860.0+x[&] *7*	(17^+)	E	XREF: E(3788.4+X). J^π: γ to (15^+) is E2, in-band ΔJ=2 transition.
3884.5+x[@] *6*	(17^-)	C	J^π: γ to (16^-) is M1+E2, in-band ΔJ=1 transition.
3980.3+x *7*		C	J^π: J^π from (^{51}V,2pnγ) (2003He25) not adopted − no argument.
4264.2+x?[@] *6*		C	E(level),J^π: questionable level because uncertain placement of its daughter γ in (^{51}V,2pnγ) (2003He25); 2003He25 assign $J^\pi=18^-$ with no argument.
4361.7+x[a] *6*	(20^+)	C E	XREF: C(3902.1+Y)E(4288.0+X). J^π: γ to (18^+) is E2, in-band ΔJ=2 transition.
4750.0+x[&] *12*	(19^+)	E	XREF: E(4678.4+X). J^π: γ to (17^+) is (E2), in-band ΔJ=2 transition.
5269.1+x[a] *7*	(22^+)	C E	XREF: C(4809.5+Y)E(5194.9+X). J^π: γ to (20^+) is (E2), in-band ΔJ=2 transition.
5365.2+x *7*	(22^+)	C E	XREF: C(4905.6+Y)E(5290.4+X). J^π: γ to (20^+) is (E2).
6260.8+x[a] *8*	(24^+)	C E	XREF: C(5801.2+Y)E(6186.9+X). J^π: γ to (22^+) is (E2), in-band ΔJ=2 transition.
7334.7+x?[a] *16*	(26^+)	E	XREF: E(7260.6+X). J^π: γ to (24^+) is (E2), in-band ΔJ=2 transition.
0+y[d]	J	C	XREF: C(0+Z). Additional information 2.

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Adopted Levels, Gammas (continued)

^{140}Eu Levels (continued)

E(level)	J^π	XREF	Comments
			E(level): y>1615+x, since the γ rays are in coincidence with transitions from 1615+x and 898+x levels.
153.70+y[d] *20*	J+1	C	XREF: C(153.70+Z). J^π: γ to J is M1+E2, in-band ΔJ=1 transition.
363.6+y[d] *3*	J+2	C	XREF: C(363.6+Z). J^π: γ to J+1 is M1+E2, in-band ΔJ=1 transition.
639.2+y[d] *4*	J+3	C	XREF: C(639.2+Z). J^π: γ to J+2 is M1+E2, in-band ΔJ=1 transition.
1035.9+y[d] *4*	J+4	C	XREF: C(1035.9+Z). J^π: γ to J+3 is M1+E2, in-band ΔJ=1 transition.
1507.1+y[d] *5*	J+5	C	XREF: C(1507.1+Z). J^π: γ to J+4 is M1+E2, in-band ΔJ=1 transition.

† The 300 ns isomer is 8^+ by measurements of (^{54}Fe,n5pγ) (2006Ta08) and ^{107}Ag(^{36}Ar,n2pγ) (2002Cu05), and 9^+ of (^{51}V,2pnγ) (2003He25) based on systematics of ΔJ=1−separated 9^+ to 15^+ levels of Z=55-63, N=73-77 odd-odd nuclei (Fig. 8, see also 1996Li13). 2003He25 found that the level spacings relative to 10^+ follow the systematic trends when 9^+ is assigned to isomer, and not 8^+ as of 2002Cu05. However including the 71γ of 2003He25 to feed directly the isomer in 2002Cu05 data (71γ is unplaced in 2002Cu05) brings 2002Cu05 in better agreement with systematics. Later 2006Ta08 confirmed 8^+. Based on that *the* evaluator adopted 8^+ and 71γ, and all higher *positive-parity levels having spins greater by 1 than 2002Cu05 and smaller by 1* than 2003He25.

‡ Band(A): $\pi(g_{7/2},d_{5/2})\otimes\nu h_{11/2}$, α=0.

Band(a): $\pi(g_{7/2},d_{5/2})\otimes\nu h_{11/2}$, α=1. From (^{92}Mo(^{51}V,2pnγ)) (2003He25) (band $\pi h_{11/2}\nu g_{7/2}$, α=1 in ^{107}Ag(^{36}Ar,n2pγ) (2002Cu05)).

@ Band(B): $\pi(g_{7/2},d_{5/2})\otimes\nu h_{11/2}$ with mixing between the two π orbitals.

& Band(C): $\pi h_{11/2}\nu h_{11/2}$, α=1. (α=0 in ^{92}Mo(^{51}V,2pnγ) and ^{107}Ag(^{36}Ar,n2pγ)).

a Band(c): $\pi h_{11/2}\nu h_{11/2}$, α=0. (α=1 in ^{92}Mo(^{51}V,2pnγ) and ^{107}Ag(^{36}Ar,n2pγ)).

b Band(D): $\pi h_{11/2}\otimes\nu h_{11/2}$ most likely conf assigned by 2003He25 in ^{92}Mo(^{51}V,2pnγ)).

c Band(E): (10) band. ((11) band in ^{92}Mo(^{51}V,2pnγ)).

d Band(F): ΔJ=1 band. Possibly the structure is similar to ΔJ=1 high-spin structure of band $\pi(g_{7/2},d_{5/2})\otimes\nu h_{11/2}$.

γ(^{140}Eu)

For unplaced γ rays see ^{140}Gd ε decay and ^{107}Ag(^{36}Ar,n2pγ).

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	α[#]	Comments
174.59	2^+	174.8 *2*	100	0.0	1^+	M1	0.381	α(K)=0.323 *5*; α(L)=0.0458 *7*; α(M)=0.00989 *15*; α(N+..)=0.00266 *4* α(N)=0.00227 *4*; α(O)=0.000360 *6*; α(P)=3.56×10^{-5} *6* Mult.: α(K)exp, α(L)exp, ^{140}Gd ε (1988Tu05).
185.3	3^+	(10.7)		174.59	2^+	[M1]	207	α(L)=162.0 *23*; α(M)=35.3 *5*; α(N+..)=9.47 *14* α(N)=8.07 *12*; α(O)=1.274 *18*; α(P)=0.1245 *18*
		185.3 *3*		0.0	1^+	E2	0.278	α(K)=0.193 *3*; α(L)=0.0666 *11*; α(M)=0.01525 *24*; α(N+..)=0.00391 *6* α(N)=0.00341 *6*; α(O)=0.000482 *8*; α(P)=1.618×10^{-5} *24* Mult.: α(K)exp, ^{140}Eu IT (1991Fi03).
191.24		191.2 *1*	100	0.0	1^+			

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Adopted Levels, Gammas (continued)

$\gamma(^{140}Eu)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	α[#]	Comments
0+x	(5⁻)	<48[&]				(M2)		E_γ: Upper limit for Eγ established by 1991Fi03 (IT decay) from absence of K x-ray intensity associated with isomeric decay (Eγ<49 in ^{92}Mo(^{54}Fe,n5pγ)). Mult.: based on RUL, ^{140}Eu IT (1991Fi03).
		<59[&]				(E3)		E_γ: Upper limit for Eγ established by 1991Fi03 (IT decay) from absence of K x-ray intensity associated with isomeric decay. Mult.: based on RUL, ^{140}Eu IT (1991Fi03).
361.3		186.7 *3*	100	174.59	2⁺			
170.41+x	(6⁻)	170.4 *3*	100	0+x	(5⁻)	M1+E2	0.390 *21*	α(K)=0.30 *5*; α(L)=0.072 *23*; α(M)=0.016 *6*; α(N+..)=0.0042 *14* α(N)=0.0036 *12*; α(O)=0.00053 *15*; α(P)=2.9×10^{-5} *9* ce(N)/(γ+ce)=0.0026 *9*; ce(O)/(γ+ce)=0.00038 *11*; ce(P)/(γ+ce)=2.1×10^{-5} *7* E_γ: 170.0γ+170.4γ form a doublet structure (2003He25). Mult.: α(K)exp in (^{54}Fe,n5pγ) (2006Ta08).
379.00		379.0 *1*	100	0.0	1⁺			
417.72		417.7 *1*	100	0.0	1⁺			
427.92		236.7 *1*	78 *11*	191.24				
		253.3 *2*	78 *17*	174.59	2⁺			
		427.9 *2*	100 *11*	0.0	1⁺			
446.98		272.4 *1*	14	174.59	2⁺			
		446.9 *3*	100	0.0	1⁺			
453.25		261.8 *2*	40 *7*	191.24		M1	0.1265	α(K)=0.1073 *16*; α(L)=0.01507 *22*; α(M)=0.00325 *5*; α(N+..)=0.000875 *13* α(N)=0.000745 *11*; α(O)=0.0001183 *17*; α(P)=1.178×10^{-5} *17* Mult.: α(K)exp in ^{140}Gd ε (1988Tu05).
		278.4 *5*	53 *7*	174.59	2⁺			
		453.4 *2*	100 *32*	0.0	1⁺			
284.82+x	(6⁻)	284.8 *3*	100	0+x	(5⁻)	M1+E2	0.085 *17*	α(K)=0.069 *17*; α(L)=0.0123 *3*; α(M)=0.00270 *12*; α(N+..)=0.000714 *20* α(N)=0.000613 *22*; α(O)=9.34×10^{-5} *16*; α(P)=7.1×10^{-6} *23* ce(N)/(γ+ce)=0.000565 *22*; ce(O)/(γ+ce)=8.61×10^{-5} *20*; ce(P)/(γ+ce)=6.6×10^{-6} *22* γ also measured by 2002Cu05 in ^{107}Ag(^{36}Ar,n2pγ) (from different parent level). Mult.: α(K)exp in (^{54}Fe,n5pγ) (2006Ta08).
488.1		313.5 *3*	100	174.59	2⁺			
535.7		344.5 *4*	100	191.24				
546.54		372.0 *2*	19 *6*	174.59	2⁺			
		546.5 *2*	100 *9*	0.0	1⁺			
361.48+x	(7⁻)	190.8 *3*	100 *25*	170.41+x	(6⁻)	M1+E2	0.276 *24*	α(K)=0.21 *4*; α(L)=0.047 *12*; α(M)=0.011 *3*; α(N+..)=0.0028 *7* α(N)=0.0024 *7*; α(O)=0.00035 *8*; α(P)=2.1×10^{-5} *7* ce(N)/(γ+ce)=0.0019 *5*; ce(O)/(γ+ce)=0.00028 *6*; ce(P)/(γ+ce)=1.7×10^{-5} *6* Mult.: α(exp) in (^{54}Fe,n5pγ) (2006Ta08).
		361.5 *3*	88 *25*	0+x	(5⁻)	E2	0.0332	α(K)=0.0263 *4*; α(L)=0.00539 *8*; α(M)=0.001202

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Adopted Levels, Gammas (continued)

$\gamma(^{140}Eu)$ (continued)

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.‡	α#	Comments
								18; α(N+..)=0.000314 *5* α(N)=0.000271 *4*; α(O)=4.03×10^{-5} *6*; α(P)=2.52×10^{-6} *4* ce(N)/(γ+ce)=0.000262 *4*; ce(O)/(γ+ce)=3.90×10^{-5} *6*; ce(P)/(γ+ce)=2.43×10^{-6} *4* Mult.: deduced by 2002Cu05 in ^{107}Ag(^{36}Ar,n2pγ); confirmed in (^{51}V,2pnγ) (2003He25).
389.27+x	(7$^-$)	104.5 *3*	100 *22*	284.82+x	(6$^-$)	(M1+E2)	1.85 *23*	α(K)=1.21 *17*; α(L)=0.5 *3*; α(M)=0.11 *8*; α(N+..)=0.029 *18* α(N)=0.025 *16*; α(O)=0.0036 *21*; α(P)=0.00011 *4* ce(N)/(γ+ce)=0.009 *6*; ce(O)/(γ+ce)=0.0013 *8*; ce(P)/(γ+ce)=4.0×10^{-5} *14* γ placement from (^{54}Fe,n5pγ) (2006Ta08), also measured in ^{107}Ag(^{36}Ar,n2pγ) (2002Cu05). Mult.: α(exp) limits in (^{54}Fe,n5pγ) (2006Ta08; E2 not excluded); ^{107}Ag(^{36}Ar,n2pγ): (E1) from different parent level (2002Cu05).
		389.2 *3*	78 *33*	0+x	(5$^-$)	(E2)	0.0267	α(K)=0.0214 *3*; α(L)=0.00421 *6*; α(M)=0.000936 *14*; α(N+..)=0.000245 *4* α(N)=0.000211 *3*; α(O)=3.16×10^{-5} *5*; α(P)=2.07×10^{-6} *3* ce(N)/(γ+ce)=0.000206 *3*; ce(O)/(γ+ce)=3.08×10^{-5} *5*; ce(P)/(γ+ce)=2.01×10^{-6} *3* Mult.: γ placement and mult from (^{54}Fe,n5pγ) (2006Ta08); also measured in ^{107}Ag(^{36}Ar,n2pγ) (2002Cu05, (M2) from different parent level).
610.99		436.4 *2*	100	174.59	2$^+$			
422.42+x	(7$^-$)	33.0 *10*	10 *5*	389.27+x	(7$^-$)	(M1)	7.3 *7*	α(L)=5.7 *6*; α(M)=1.24 *12*; α(N+..)=0.33 *4* α(N)=0.28 *3*; α(O)=0.045 *5*; α(P)=0.0044 *5* ce(N)/(γ+ce)=0.034 *5*; ce(O)/(γ+ce)=0.0054 *7*; ce(P)/(γ+ce)=0.00053 *7* γ measured only in (^{54}Fe,n5pγ) (2006Ta08).
		137.5 *3*	25 *5*	284.82+x	(6$^-$)	(M1+E2)	0.762 *20*	α(K)=0.55 *8*; α(L)=0.16 *8*; α(M)=0.037 *18*; α(N+..)=0.010 *5* α(N)=0.008 *4*; α(O)=0.0012 *5*; α(P)=5.3×10^{-5} *17* ce(N)/(γ+ce)=0.0047 *22*; ce(O)/(γ+ce)=0.0007 *3*; ce(P)/(γ+ce)=3.0×10^{-5} *10* γ placement and mult from (^{54}Fe,n5pγ) (2006Ta08); also measured in ^{107}Ag(^{36}Ar,n2pγ)–2002Cu05 ((E1), from different parent level).
		252.0 *3*	85 *12*	170.41+x	(6$^-$)	M1+E2	0.121 *20*	α(K)=0.097 *22*; α(L)=0.0182 *16*; α(M)=0.0040 *5*; α(N+..)=0.00106 *10* α(N)=0.00091 *9*; α(O)=0.000138 *8*; α(P)=1.0×10^{-5} *4* ce(N)/(γ+ce)=0.00082 *9*; ce(O)/(γ+ce)=0.000123 *7*; ce(P)/(γ+ce)=9.E−6 *3*

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Adopted Levels, Gammas (continued)

γ(^{140}Eu) (continued)

E$_i$(level)	J$^\pi_i$	E$_\gamma$†	I$_\gamma$†	E$_f$	J$^\pi_f$	Mult.‡	α#	Comments
								Mult.: α(exp) in (^{54}Fe,n5pγ) (2006Ta08); ^{107}Ag(^{36}Ar,n2pγ) found (E1) (2002Cu05).
422.42+x	(7$^-$)	422.5 *3*	100 *17*	0+x	(5$^-$)	[E2]	0.0212	α(K)=0.01706 *25*; α(L)=0.00322 *5*; α(M)=0.000715 *11*; α(N+..)=0.000188 *3* α(N)=0.0001616 *23*; α(O)=2.43×10^{-5} *4*; α(P)=1.669×10^{-6} *24* ce(N)/(γ+ce)=0.0001582 *23*; ce(O)/(γ+ce)=2.38×10^{-5} *4*; ce(P)/(γ+ce)=1.634×10^{-6} *23* Mult.: ^{107}Ag(^{36}Ar,n2pγ) found (M2) (2002Cu05).
459.5+x	(8$^+$)	37.1 *3*	100 *9*	422.42+x	(7$^-$)	E1	0.737 *20*	α(L)=0.580 *16*; α(M)=0.126 *4*; α(N+..)=0.0319 *9* α(N)=0.0278 *8*; α(O)=0.00387 *11*; α(P)=0.000226 *6* ce(N)/(γ+ce)=0.0160 *5*; ce(O)/(γ+ce)=0.00223 *7*; ce(P)/(γ+ce)=0.000130 *4* B(E1)(W.u.)=7.9×10^{-6} *10* Mult.: α(exp) in (^{54}Fe,n5pγ) (2006Ta08); ^{107}Ag(^{36}Ar,n2pγ) (2002Cu05) found (M1).
		98.1 *3*	26 *3*	361.48+x	(7$^-$)	E1	0.299	α(K)=0.251 *4*; α(L)=0.0375 *7*; α(M)=0.00808 *14*; α(N+..)=0.00211 *4* α(N)=0.00182 *3*; α(O)=0.000273 *5*; α(P)=2.09×10^{-5} *4* ce(N)/(γ+ce)=0.001399 *24*; ce(O)/(γ+ce)=0.000210 *4*; ce(P)/(γ+ce)=1.61×10^{-5} *3* B(E1)(W.u.)=1.11×10^{-7} *16* Mult.: α(exp) in (^{54}Fe,n5pγ) (2006Ta08); confirmed in ^{107}Ag(^{36}Ar,n2pγ) (2002Cu05).
687.04		495.8 *2*	100	191.24				
530.5+x	(9$^+$)	71.0 *2*	100	459.5+x	(8$^+$)	(M1+E2)	6.9 *20*	α(K)=3.4 *8*; α(L)=2.7 *21*; α(M)=0.6 *5*; α(N+..)=0.16 *13* α(N)=0.14 *11*; α(O)=0.019 *15*; α(P)=0.00033 *14* γ ray from (^{51}V,2pnγ) (2003He25), while unplaced in ^{107}Ag(^{36}Ar,n2pγ) (2002Cu05). Mult.: deduced in (^{51}V,2pnγ) (2003He25).
722.28		269.0 *2*	7.0 *22*	453.25				
		304.5 *2*	4.8 *22*	417.72				
		722.3 *1*	100 *15*	0.0	1$^+$			
749.94	1$^+$	296.6 *2*	12.7 *13*	453.25		M1	0.0906	α(K)=0.0769 *11*; α(L)=0.01076 *16*; α(M)=0.00232 *4*; α(N+..)=0.000625 *9* α(N)=0.000532 *8*; α(O)=8.45×10^{-5} *12*; α(P)=8.43×10^{-6} *12* Mult.: α(K)exp in ^{140}Gd ε (1988Tu05).
		558.7 *3*	33 *3*	191.24				
		575.4 *1*	39 *4*	174.59	2$^+$	M1	0.01638	α(K)=0.01395 *20*; α(L)=0.00191 *3*; α(M)=0.000411 *6*; α(N+..)=0.0001105 *16* α(N)=9.41×10^{-5} *14*; α(O)=1.497×10^{-5} *21*; α(P)=1.510×10^{-6} *22* Mult.: α(K)exp in ^{140}Gd ε (1988Tu05).
		749.9 *1*	100 *6*	0.0	1$^+$			
607.9+x	(8$^+$)	94.9 *2*	100	513.0+x	(7$^+$)	(M1+E2)	2.5 *4*	α(K)=1.58 *24*; α(L)=0.7 *5*; α(M)=0.17 *12*;

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Adopted Levels, Gammas (continued)

$\gamma(^{140}Eu)$ (continued)

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.‡	α#	Comments
								α(N+..)=0.04 *3* α(N)=0.04 *3*; α(O)=0.005 *4*; α(P)=0.00015 *6* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
654.80+x	(8⁻)	292.9 *4*		361.48+x	(7⁻)	M1+E2	0.078 *16*	α(K)=0.064 *16*; α(L)=0.01121 *19*; α(M)=0.00247 *8*; α(N+..)=0.000653 *12* α(N)=0.000561 *14*; α(O)=8.55×10⁻⁵ *23*; α(P)=6.6×10⁻⁶ *22* I_γ: 75; both I(292.9γ) and I(484.5γ) are lower limits in (^{51}V,2pnγ); the branchings listed here are calculated from these limits. Mult.: deduced in (^{51}V,2pnγ) (2003He25).
		484.5 *2*		170.41+x	(6⁻)	E2	0.01455	α(K)=0.01186 *17*; α(L)=0.00210 *3*; α(M)=0.000464 *7*; α(N+..)=0.0001223 *18* α(N)=0.0001051 *15*; α(O)=1.596×10⁻⁵ *23*; α(P)=1.178×10⁻⁶ *17* I_γ: 100; both I(292.9γ) and I(484.5γ) are lower limits in (^{51}V,2pnγ); the branchings listed here are calculated from these limits. Mult.: deduced in (^{51}V,2pnγ) (2003He25).
882.69		708.1 *2*	100	174.59	2⁺			
762.90+x	(8⁻)	401.4 *2*		361.48+x	(7⁻)	M1+E2	0.033 *9*	α(K)=0.027 *8*; α(L)=0.0043 *6*; α(M)=0.00094 *10*; α(N+..)=0.00025 *3* α(N)=0.000215 *24*; α(O)=3.3×10⁻⁵ *5*; α(P)=2.9×10⁻⁶ *10* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
		478.1 *4*		284.82+x	(6⁻)	E2	0.01508	α(K)=0.01228 *18*; α(L)=0.00219 *4*; α(M)=0.000483 *7*; α(N+..)=0.0001273 *19* α(N)=0.0001095 *16*; α(O)=1.661×10⁻⁵ *24*; α(P)=1.218×10⁻⁶ *18* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
1077.8		903.2 *3*	100	174.59	2⁺			
896.4+x	(10⁺)	365.8 *3*	100	530.5+x	(9⁺)	M1+E2	0.042 *10*	α(K)=0.035 *10*; α(L)=0.0057 *5*; α(M)=0.00124 *9*; α(N+..)=0.00033 *3* α(N)=0.000282 *23*; α(O)=4.4×10⁻⁵ *5*; α(P)=3.6×10⁻⁶ *12* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
898.88+x	(9⁻)	244.0& *2*	≥29	654.80+x	(8⁻)	M1+E2	0.132 *21*	α(K)=0.106 *24*; α(L)=0.0203 *21*; α(M)=0.0045 *6*; α(N+..)=0.00118 *13* α(N)=0.00102 *12*; α(O)=0.000154 *11*; α(P)=1.1×10⁻⁵ *4* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
		537.4 *1*	100	361.48+x	(7⁻)	E2	0.01108	α(K)=0.00910 *13*; α(L)=0.001548 *22*; α(M)=0.000340 *5*; α(N+..)=8.98×10⁻⁵ *13* α(N)=7.71×10⁻⁵ *11*; α(O)=1.178×10⁻⁵ *17*; α(P)=9.12×10⁻⁷ *13* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
1092.6		918 *1*	100	174.59	2⁺			
1131.1		1131.1 *3*	100	0.0	1⁺			
994.0+x	(10⁺)	386.1 *2*	100	607.9+x	(8⁺)	E2	0.0274	α(K)=0.0218 *3*; α(L)=0.00432 *6*; α(M)=0.000961 *14*; α(N+..)=0.000252 *4* α(N)=0.000217 *3*; α(O)=3.25×10⁻⁵ *5*; α(P)=2.11×10⁻⁶ *3* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
1014.5+x	(10⁺)	(20.5)		994.0+x	(10⁺)			E_γ: (^{51}V,2pnγ) (2003He25) propose this

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Adopted Levels, Gammas (continued)

$\gamma(^{140}Eu)$ (continued)

E_i(level)	J_i^π	E_γ†	I_γ†	E_f	J_f^π	Mult.‡	α#	Comments
								unobserved transition based upon possible (646.8γ)(386.1γ) coincidence.
1014.5+x	(10⁺)	406.6 *2*	≥100	607.9+x	(8⁺)	E2	0.0236	α(K)=0.0189 *3*; α(L)=0.00365 *6*; α(M)=0.000810 *12*; α(N+..)=0.000212 *3* α(N)=0.000183 *3*; α(O)=2.75×10⁻⁵ *4*; α(P)=1.84×10⁻⁶ *3* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
		483.5 *4*	15	530.5+x	(9⁺)	M1+E2	0.020 *6*	α(K)=0.017 *5*; α(L)=0.0025 *5*; α(M)=0.00055 *9*; α(N+..)=0.000148 *25* α(N)=0.000126 *21*; α(O)=2.0×10⁻⁵ *4*; α(P)=1.8×10⁻⁶ *6* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
1215.99		1041.4 *2*	100	174.59	2⁺			
1171.1+x	(11⁺)	274.7 *3*	19 *3*	896.4+x	(10⁺)	M1+E2	0.094 *18*	α(K)=0.076 *18*; α(L)=0.0138 *6*; α(M)=0.00304 *19*; α(N+..)=0.00080 *4* α(N)=0.00069 *4*; α(O)=0.0001047 *18*; α(P)=8.E−6 *3* I_γ: average of the values in (^{51}V,2pnγ) and ^{107}Ag(^{36}Ar,n2pγ). Mult.: deduced in (^{51}V,2pnγ) (2003He25).
		640.6 *1*	100 *14*	530.5+x	(9⁺)	E2	0.00714	α(K)=0.00593 *9*; α(L)=0.000947 *14*; α(M)=0.000207 *3*; α(N+..)=5.49×10⁻⁵ *8* α(N)=4.70×10⁻⁵ *7*; α(O)=7.25×10⁻⁶ *11*; α(P)=6.01×10⁻⁷ *9* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
1364.6+x	(10⁻)	601.7 *2*		762.90+x	(8⁻)	E2	0.00832	α(K)=0.00689 *10*; α(L)=0.001124 *16*; α(M)=0.000246 *4*; α(N+..)=6.52×10⁻⁵ *10* α(N)=5.59×10⁻⁵ *8*; α(O)=8.59×10⁻⁶ *12*; α(P)=6.96×10⁻⁷ *10* I_γ: 64; both I(601.7γ) and I(709.4γ) are lower limits in (^{51}V,2pnγ); the branchings listed here are calculated from these limits. Mult.: deduced in (^{51}V,2pnγ) (2003He25).
		709.4 *4*		654.80+x	(8⁻)	E2	0.00560	α(K)=0.00467 *7*; α(L)=0.000724 *11*; α(M)=0.0001576 *23*; α(N+..)=4.19×10⁻⁵ *6* α(N)=3.59×10⁻⁵ *5*; α(O)=5.56×10⁻⁶ *8*; α(P)=4.76×10⁻⁷ *7* I_γ: 100; both I(601.7γ) and I(709.4γ) are lower limits in (^{51}V,2pnγ); the branchings listed here are calculated from these limits. Mult.: deduced in (^{51}V,2pnγ) (2003He25).
1376.5+x	(10⁻)	722.0 *3*	100	654.80+x	(8⁻)	E2	0.00537	α(K)=0.00449 *7*; α(L)=0.000692 *10*; α(M)=0.0001506 *22*; α(N+..)=4.00×10⁻⁵ *6* α(N)=3.43×10⁻⁵ *5*; α(O)=5.31×10⁻⁶ *8*; α(P)=4.58×10⁻⁷ *7* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
1603.8+x	(12⁺)	609.8 *4*	100	994.0+x	(10⁺)	E2	0.00805	α(K)=0.00667 *10*; α(L)=0.001083 *16*; α(M)=0.000237 *4*; α(N+..)=6.28×10⁻⁵ *9* α(N)=5.38×10⁻⁵ *8*; α(O)=8.28×10⁻⁶ *12*; α(P)=6.75×10⁻⁷ *10* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
1614.5+x	(11⁻)	715.6 *2*	100	898.88+x	(9⁻)	E2	0.00548	α(K)=0.00458 *7*; α(L)=0.000708 *10*;

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Adopted Levels, Gammas (continued)

$\gamma(^{140}Eu)$ (continued)

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.‡	α#	Comments
								α(M)=0.0001541 *22*; α(N+..)=4.10×10^{-5} *6* α(N)=3.51×10^{-5} *5*; α(O)=5.44×10^{-6} *8*; α(P)=4.67×10^{-7} *7* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
1617.1+x	(12$^+$)	446.0 *1*	100 *8*	1171.1+x	(11$^+$)	M1+E2	0.025 *7*	α(K)=0.021 *6*; α(L)=0.0032 *5*; α(M)=0.00070 *10*; α(N+..)=0.00019 *3* α(N)=0.000158 *23*; α(O)=2.5×10^{-5} *5*; α(P)=2.2×10^{-6} *8* Mult.: deduced in ^{107}Ag(^{36}Ar,n2pγ) (2002Cu05); confirmed in (^{51}V,2pnγ) (2003He25).
		720.6 *2*	25 *10*	896.4+x	(10$^+$)	E2	0.00540	α(K)=0.00451 *7*; α(L)=0.000695 *10*; α(M)=0.0001514 *22*; α(N+..)=4.02×10^{-5} *6* α(N)=3.44×10^{-5} *5*; α(O)=5.34×10^{-6} *8*; α(P)=4.60×10^{-7} *7* Mult.: deduced in ^{107}Ag(^{36}Ar,n2pγ) (2002Cu05); confirmed in (^{51}V,2pnγ) (2003He25).
1661.6+x	(12$^+$)	490.4 *3*	46	1171.1+x	(11$^+$)	M1+E2	0.019 *6*	α(K)=0.016 *5*; α(L)=0.0024 *5*; α(M)=0.00053 *9*; α(N+..)=0.000142 *25* α(N)=0.000121 *21*; α(O)=1.9×10^{-5} *4*; α(P)=1.7×10^{-6} *6* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
		646.8 *3*	100 *69*	1014.5+x	(10$^+$)	(E2)	0.00697	α(K)=0.00580 *9*; α(L)=0.000923 *13*; α(M)=0.000202 *3*; α(N+..)=5.35×10^{-5} *8* α(N)=4.58×10^{-5} *7*; α(O)=7.07×10^{-6} *10*; α(P)=5.88×10^{-7} *9* E_γ: 646.8+647.7 form a doublet structure.
1959.9+x	(12$^-$)	345.4 *3*	100	1614.5+x	(11$^-$)	M1+E2	0.049 *12*	α(K)=0.041 *11*; α(L)=0.0067 *5*; α(M)=0.00148 *8*; α(N+..)=0.000391 *25* α(N)=0.000336 *19*; α(O)=5.2×10^{-5} *5*; α(P)=4.2×10^{-6} *14* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
1978.3+x	(13$^+$)	361.3 *2*	100 *10*	1617.1+x	(12$^+$)	M1+E2	0.044 *11*	α(K)=0.036 *10*; α(L)=0.0059 *5*; α(M)=0.00129 *9*; α(N+..)=0.00034 *3* α(N)=0.000293 *22*; α(O)=4.5×10^{-5} *5*; α(P)=3.8×10^{-6} *13* Mult.: deduced in ^{107}Ag(^{36}Ar,n2pγ) (2002Cu05); confirmed in (^{51}V,2pnγ) (2003He25).
		807.3 *2*	31 *10*	1171.1+x	(11$^+$)	E2	0.00416	α(K)=0.00350 *5*; α(L)=0.000523 *8*; α(M)=0.0001135 *16*; α(N+..)=3.02×10^{-5} *5* α(N)=2.59×10^{-5} *4*; α(O)=4.03×10^{-6} *6*; α(P)=3.58×10^{-7} *5* Mult.: deduced in ^{107}Ag(^{36}Ar,n2pγ) (2002Cu05); confirmed in (^{51}V,2pnγ) (2003He25).
2169.8+x	(12$^-$)	805.3 *3*	100	1364.6+x	(10$^-$)	E2	0.00419	α(K)=0.00352 *5*; α(L)=0.000526 *8*; α(M)=0.0001142 *16*; α(N+..)=3.04×10^{-5} *5* α(N)=2.60×10^{-5} *4*; α(O)=4.05×10^{-6} *6*; α(P)=3.60×10^{-7} *5* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
2197.3+x	(12$^-$)	821.0 *3*		1376.5+x	(10$^-$)	E2	0.00401	α(K)=0.00337 *5*; α(L)=0.000502 *7*;

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Adopted Levels, Gammas (continued)

γ(^{140}Eu) (continued)

E_i(level)	J^π_i	E_γ †	I_γ †	E_f	J^π_f	Mult. ‡	α #	Comments
								α(M)=0.0001089 *16*; α(N+..)=2.90×10^{-5} *4* α(N)=2.48×10^{-5} *4*; α(O)=3.87×10^{-6} *6*; α(P)=3.45×10^{-7} *5* I_γ: 42; both I(821.0γ) and I(832.3γ) are lower limits in (^{51}V,2pnγ); the branchings listed here are calculated from these limits. Mult.: deduced in (^{51}V,2pnγ) (2003He25).
2197.3+x	(12⁻)	832.3 *3*		1364.6+x	(10⁻)	E2	0.00389	α(K)=0.00327 *5*; α(L)=0.000486 *7*; α(M)=0.0001053 *15*; α(N+..)=2.81×10^{-5} *4* α(N)=2.40×10^{-5} *4*; α(O)=3.74×10^{-6} *6*; α(P)=3.35×10^{-7} *5* I_γ: 100; both I(821.0γ) and I(832.3γ) are lower limits in (^{51}V,2pnγ); the branchings listed here are calculated from these limits. Mult.: deduced in (^{51}V,2pnγ) (2003He25).
2223.1+x	(14⁺)	619.3@ *3*	100@	1603.8+x	(12⁺)	E2	0.00775	α(K)=0.00643 *9*; α(L)=0.001038 *15*; α(M)=0.000227 *4*; α(N+..)=6.02×10^{-5} *9* α(N)=5.16×10^{-5} *8*; α(O)=7.94×10^{-6} *12*; α(P)=6.51×10^{-7} *10* E_γ: 619.3+619.3 form a doublet structure. Mult.: deduced in (^{51}V,2pnγ) (2003He25).
2427.7+x	(13⁻)	230.4 *1*	100 *10*	2197.3+x	(12⁻)	M1+E2	0.157 *22*	α(K)=0.13 *3*; α(L)=0.025 *4*; α(M)=0.0055 *9*; α(N+..)=0.00144 *20* α(N)=0.00124 *19*; α(O)=0.000186 *19*; α(P)=1.3×10^{-5} *4* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
		258.0 *2*	35 *10*	2169.8+x	(12⁻)	M1+E2	0.113 *19*	α(K)=0.091 *21*; α(L)=0.0169 *13*; α(M)=0.0037 *4*; α(N+..)=0.00098 *8* α(N)=0.00085 *8*; α(O)=0.000128 *6*; α(P)=9.E−6 *3* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
2444.5+x	(13⁻)	830.0 *3*	100	1614.5+x	(11⁻)	E2	0.00391	α(K)=0.00329 *5*; α(L)=0.000489 *7*; α(M)=0.0001060 *15*; α(N+..)=2.83×10^{-5} *4* α(N)=2.42×10^{-5} *4*; α(O)=3.77×10^{-6} *6*; α(P)=3.37×10^{-7} *5* Mult.: deduced in ^{107}Ag(^{36}Ar,n2pγ) (2002Cu05); confirmed in (^{51}V,2pnγ) (2003He25).
2448.9+x	(14⁺)	470.5 *2*	74 *7*	1978.3+x	(13⁺)	M1+E2	0.021 *6*	α(K)=0.018 *6*; α(L)=0.0027 *5*; α(M)=0.00060 *9*; α(N+..)=0.00016 *3* α(N)=0.000136 *22*; α(O)=2.1×10^{-5} *4*; α(P)=1.9×10^{-6} *7* Mult.: deduced in ^{107}Ag(^{36}Ar,n2pγ) (2002Cu05); confirmed in (^{51}V,2pnγ) (2003He25).
		787.3 *3*	100 *10*	1661.6+x	(12⁺)	E2	0.00441	α(K)=0.00370 *6*; α(L)=0.000556 *8*; α(M)=0.0001208 *17*; α(N+..)=3.22×10^{-5} *5* α(N)=2.75×10^{-5} *4*; α(O)=4.28×10^{-6} *6*; α(P)=3.78×10^{-7} *6* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
		831.9 *3*	79 *10*	1617.1+x	(12⁺)	E2	0.00389	α(K)=0.00327 *5*; α(L)=0.000486 *7*; α(M)=0.0001055 *15*; α(N+..)=2.81×10^{-5} *4*

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Adopted Levels, Gammas (continued)

$\gamma(^{140}Eu)$ (continued)

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.‡	α#	Comments
								α(N)=2.40×10^{-5} 4; α(O)=3.75×10^{-6} 6; α(P)=3.36×10^{-7} 5 Mult.: deduced in ^{107}Ag(^{36}Ar,n2pγ) (2002Cu05); confirmed in (^{51}V,2pnγ) (2003He25).
2479.9+x	(14$^+$)	502.1 4	100	1978.3+x	(13$^+$)	M1+E2	0.018 5	α(K)=0.015 5; α(L)=0.0023 4; α(M)=0.00050 9; α(N+..)=0.000133 24 α(N)=0.000114 20; α(O)=1.8×10^{-5} 4; α(P)=1.6×10^{-6} 6 Mult.: deduced in (^{51}V,2pnγ) (2003He25).
		817.5 5	87 43	1661.6+x	(12$^+$)	E2	0.00405	α(K)=0.00340 5; α(L)=0.000507 8; α(M)=0.0001101 16; α(N+..)=2.93×10^{-5} 5 α(N)=2.51×10^{-5} 4; α(O)=3.91×10^{-6} 6; α(P)=3.48×10^{-7} 5 Mult.: deduced in (^{51}V,2pnγ) (2003He25).
2597.7+x	(14$^-$)	170.0 2	100	2427.7+x	(13$^-$)	(M1+E2)	0.392 21	α(K)=0.30 5; α(L)=0.072 23; α(M)=0.016 6; α(N+..)=0.0042 14 α(N)=0.0037 13; α(O)=0.00054 15; α(P)=3.0×10^{-5} 9 E_γ: 170.0+170.6 form a doublet structure. Mult.: assumed in (^{51}V,2pnγ) (2003He25).
2842.4+x	(16$^+$)	619.3@ 3	100@	2223.1+x	(14$^+$)	(E2)	0.00775	α(K)=0.00643 9; α(L)=0.001038 15; α(M)=0.000227 4; α(N+..)=6.02×10^{-5} 9 α(N)=5.16×10^{-5} 8; α(O)=7.94×10^{-6} 12; α(P)=6.51×10^{-7} 10 E_γ: 619.3+619.3 form a doublet structure.
2884.9+x	(14$^-$)	925.0 3	100	1959.9+x	(12$^-$)	E2	0.00309	α(K)=0.00261 4; α(L)=0.000378 6; α(M)=8.18×10^{-5} 12; α(N+..)=2.18×10^{-5} 3 α(N)=1.87×10^{-5} 3; α(O)=2.92×10^{-6} 4; α(P)=2.68×10^{-7} 4 Mult.: deduced in (^{51}V,2pnγ) (2003He25).
2898.4+x	(15$^+$)	920.0 3	100	1978.3+x	(13$^+$)	E2	0.00312	α(K)=0.00264 4; α(L)=0.000383 6; α(M)=8.29×10^{-5} 12; α(N+..)=2.21×10^{-5} 4 α(N)=1.89×10^{-5} 3; α(O)=2.96×10^{-6} 5; α(P)=2.71×10^{-7} 4 Mult.: assumed in (^{51}V,2pnγ) (2003He25).
2959.8+x	(16$^+$)	510.9 2	100	2448.9+x	(14$^+$)	(E2)	0.01264	α(K)=0.01035 15; α(L)=0.00180 3; α(M)=0.000395 6; α(N+..)=0.0001043 15 α(N)=8.96×10^{-5} 13; α(O)=1.364×10^{-5} 20; α(P)=1.033×10^{-6} 15 Mult.: deduced in (^{51}V,2pnγ) (2003He25).
2970.6+x	(15$^-$)	372.9 2	100	2597.7+x	(14$^-$)	M1+E2	0.040 10	α(K)=0.033 9; α(L)=0.0054 5; α(M)=0.00117 10; α(N+..)=0.00031 3 α(N)=0.000267 23; α(O)=4.1×10^{-5} 5; α(P)=3.5×10^{-6} 12 Mult.: deduced in (^{51}V,2pnγ) (2003He25).
3096.0+x	(16$^+$)	616.0 5	100	2479.9+x	(14$^+$)	(E2)	0.00785	α(K)=0.00651 10; α(L)=0.001053 15; α(M)=0.000230 4; α(N+..)=6.11×10^{-5} 9 α(N)=5.24×10^{-5} 8; α(O)=8.06×10^{-6} 12; α(P)=6.59×10^{-7} 10 Mult.: deduced in (^{51}V,2pnγ) (2003He25).
3287.5+x	(15$^-$)	843		2444.5+x	(13$^-$)	(E2)		E_γ,Mult.: ^{107}Ag(^{36}Ar,n2pγ) (2002Cu05).
3424.5+x	(16$^-$)	454.0 2	100	2970.6+x	(15$^-$)	M1+E2	0.024 7	α(K)=0.020 6; α(L)=0.0030 5; α(M)=0.00066 10; α(N+..)=0.00018 3

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

γ(^{140}Eu) (continued)

E$_i$(level)	J$^\pi_i$	E$_\gamma$†	I$_\gamma$†	E$_f$	J$^\pi_f$	Mult.‡	α#	Comments
								α(N)=0.000151 *23*; α(O)=2.3×10^{-5} *4*; α(P)=2.1×10^{-6} *7* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
3424.5+x	(16$^-$)	825.3 *15*	70	2597.7+x	(14$^-$)	(E2)	0.00396	α(K)=0.00333 *5*; α(L)=0.000496 *8*; α(M)=0.0001075 *16*; α(N+..)=2.87×10^{-5} *5* α(N)=2.45×10^{-5} *4*; α(O)=3.82×10^{-6} *6*; α(P)=3.41×10^{-7} *5* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
3583.5+x	(17$^-$)	612.9 *5*	100	2970.6+x	(15$^-$)	(E2)	0.00795	α(K)=0.00659 *10*; α(L)=0.001068 *16*; α(M)=0.000234 *4*; α(N+..)=6.19×10^{-5} *9* α(N)=5.31×10^{-5} *8*; α(O)=8.17×10^{-6} *12*; α(P)=6.67×10^{-7} *10* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
3607.5+x	(18$^+$)	511.5 *3*	<36	3096.0+x	(16$^+$)	(E2)	0.01260	α(K)=0.01032 *15*; α(L)=0.00179 *3*; α(M)=0.000394 *6*; α(N+..)=0.0001039 *15* α(N)=8.93×10^{-5} *13*; α(O)=1.359×10^{-5} *20*; α(P)=1.030×10^{-6} *15* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
		647.7 *2*	100	2959.8+x	(16$^+$)	E2	0.00695	α(K)=0.00578 *8*; α(L)=0.000919 *13*; α(M)=0.000201 *3*; α(N+..)=5.33×10^{-5} *8* α(N)=4.56×10^{-5} *7*; α(O)=7.04×10^{-6} *10*; α(P)=5.86×10^{-7} *9* E$_\gamma$: 646.8+647.7 form a doublet structure. Mult.: deduced in ^{107}Ag(^{36}Ar,n2pγ) (2002Cu05); confirmed in (^{51}V,2pnγ) (2003He25).
3790.9+x?		366.3& *2*	100	3424.5+x	(16$^-$)			E$_\gamma$: measured in (^{51}V,2pnγ) (2003He25).
3860.0+x	(17$^+$)	961.6 *4*	100	2898.4+x	(15$^+$)			Mult.: deduced in ^{107}Ag(^{36}Ar,n2pγ) (2002Cu05).
3884.5+x	(17$^-$)	460.0 *3*	100	3424.5+x	(16$^-$)	(M1+E2)	0.023 *6*	α(K)=0.019 *6*; α(L)=0.0029 *5*; α(M)=0.00064 *10*; α(N+..)=0.00017 *3* α(N)=0.000145 *22*; α(O)=2.3×10^{-5} *4*; α(P)=2.0×10^{-6} *7* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
		913.7 *5*	50	2970.6+x	(15$^-$)			E$_\gamma$: measured in (^{51}V,2pnγ) (2003He25).
3980.3+x		396.8 *2*	100	3583.5+x	(17$^-$)			E$_\gamma$: measured in (^{51}V,2pnγ) (2003He25).
4264.2+x?		379.6& *2*	100	3884.5+x	(17$^-$)			E$_\gamma$: (^{51}V,2pnγ) (2003He25).
4361.7+x	(20$^+$)	754.2 *3*	100	3607.5+x	(18$^+$)	E2	0.00486	α(K)=0.00407 *6*; α(L)=0.000619 *9*; α(M)=0.0001346 *19*; α(N+..)=3.58×10^{-5} *5* α(N)=3.07×10^{-5} *5*; α(O)=4.76×10^{-6} *7*; α(P)=4.16×10^{-7} *6* Mult.: deduced in ^{107}Ag(^{36}Ar,n2pγ) (2002Cu05); confirmed in (^{51}V,2pnγ) (2003He25).
4750.0+x	(19$^+$)	890		3860.0+x	(17$^+$)	(E2)		E$_\gamma$: measured in ^{107}Ag(^{36}Ar,n2pγ) (2002Cu05).
5269.1+x	(22$^+$)	907.4 *4*	100	4361.7+x	(20$^+$)	(E2)	0.00322	α(K)=0.00272 *4*; α(L)=0.000395 *6*; α(M)=8.56×10^{-5} *12*; α(N+..)=2.28×10^{-5} *4* α(N)=1.95×10^{-5} *3*; α(O)=3.05×10^{-6} *5*; α(P)=2.79×10^{-7} *4* E$_\gamma$: measured in (^{51}V,2pnγ) (2003He25).
5365.2+x	(22$^+$)	1003.5 *3*	100	4361.7+x	(20$^+$)	(E2)	0.00260	α(K)=0.00220 *3*; α(L)=0.000314 *5*; α(M)=6.78×10^{-5} *10*; α(N+..)=1.81×10^{-5} *3* α(N)=1.546×10^{-5} *22*; α(O)=2.43×10^{-6} *4*;

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

$\gamma(^{140}Eu)$ (continued)

E_i(level)	J^π_i	E_γ [†]	I_γ [†]	E_f	J^π_f	Mult. [‡]	α [#]	Comments
								α(P)=2.26×10^{-7} *4* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
6260.8+x	(24$^+$)	991.7 *4*	100	5269.1+x	(22$^+$)	(E2)	0.00266	α(K)=0.00225 *4*; α(L)=0.000322 *5*; α(M)=6.96×10^{-5} *10*; α(N+..)=1.86×10^{-5} *3* α(N)=1.589×10^{-5} *23*; α(O)=2.49×10^{-6} *4*; α(P)=2.32×10^{-7} *4* E_γ: measured in ^{107}Ag(^{36}Ar,n2pγ) (2002Cu05) and (^{51}V,2pnγ) (2003He25).
7334.7+x?	(26$^+$)	1074 [&]		6260.8+x	(24$^+$)	(E2)		E_γ: measured in ^{107}Ag(^{36}Ar,n2pγ) (2002Cu05).
153.70+y	J+1	153.7 *2*	100	0+y	J	(M1+E2)	0.537 *12*	α(K)=0.40 *7*; α(L)=0.11 *4*; α(M)=0.024 *10*; α(N+..)=0.0062 *24* α(N)=0.0054 *22*; α(O)=0.0008 *3*; α(P)=3.9×10^{-5} *12* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
363.6+y	J+2	209.9 *2*	100	153.70+y	J+1	(M1+E2)	0.207 *24*	α(K)=0.16 *4*; α(L)=0.034 *7*; α(M)=0.0076 *17*; α(N+..)=0.0020 *4* α(N)=0.0017 *4*; α(O)=0.00025 *4*; α(P)=1.6×10^{-5} *5* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
639.2+y	J+3	275.6 *2*	100	363.6+y	J+2	(M1+E2)	0.093 *18*	α(K)=0.076 *18*; α(L)=0.0136 *6*; α(M)=0.00301 *19*; α(N+..)=0.00079 *4* α(N)=0.00068 *4*; α(O)=0.0001036 *17*; α(P)=7.8×10^{-6} *25* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
1035.9+y	J+4	396.7 *2*	100	639.2+y	J+3	(M1+E2)	0.034 *9*	α(K)=0.028 *8*; α(L)=0.0045 *6*; α(M)=0.00098 *10*; α(N+..)=0.00026 *3* α(N)=0.000222 *24*; α(O)=3.4×10^{-5} *5*; α(P)=2.9×10^{-6} *10* Mult.: deduced in (^{51}V,2pnγ) (2003He25).
1507.1+y	J+5	471.2 *3*	100	1035.9+y	J+4	(M1+E2)	0.021 *6*	α(K)=0.018 *6*; α(L)=0.0027 *5*; α(M)=0.00060 *9*; α(N+..)=0.00016 *3* α(N)=0.000136 *22*; α(O)=2.1×10^{-5} *4*; α(P)=1.9×10^{-6} *7* Mult.: deduced in (^{51}V,2pnγ) (2003He25).

[†] From ^{140}Eu IT (1991Fi03) for transitions below the 125 ms isomer; from (^{54}Fe,n5pγ) (2006Ta08) for transitions in between the 125 ms and 300 ns isomers; mostly from (^{51}V,2pnγ) (2003He25), and ^{107}Ag(^{36}Ar,n2pγ) (2002Cu05) for transitions above the 300 ns isomer.

[‡] Mult from (^{51}V,2pnγ) (2003He25) deduced from measured ang dist, R(DCO), and pol (asym); mult from ^{107}Ag(^{36}Ar,n2pγ) (2002Cu05) deduced by comparison of I(γ+ce)′s calculated with α(E1), α(M1), and α(E2). When discrepant, 2003He25 method was considered more reliable. Most assignments are presented in Comments (based on this footnote). Also given in Comments are mult assignments based on experimental conversion coefficients.

[#] 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 with undivided intensity.

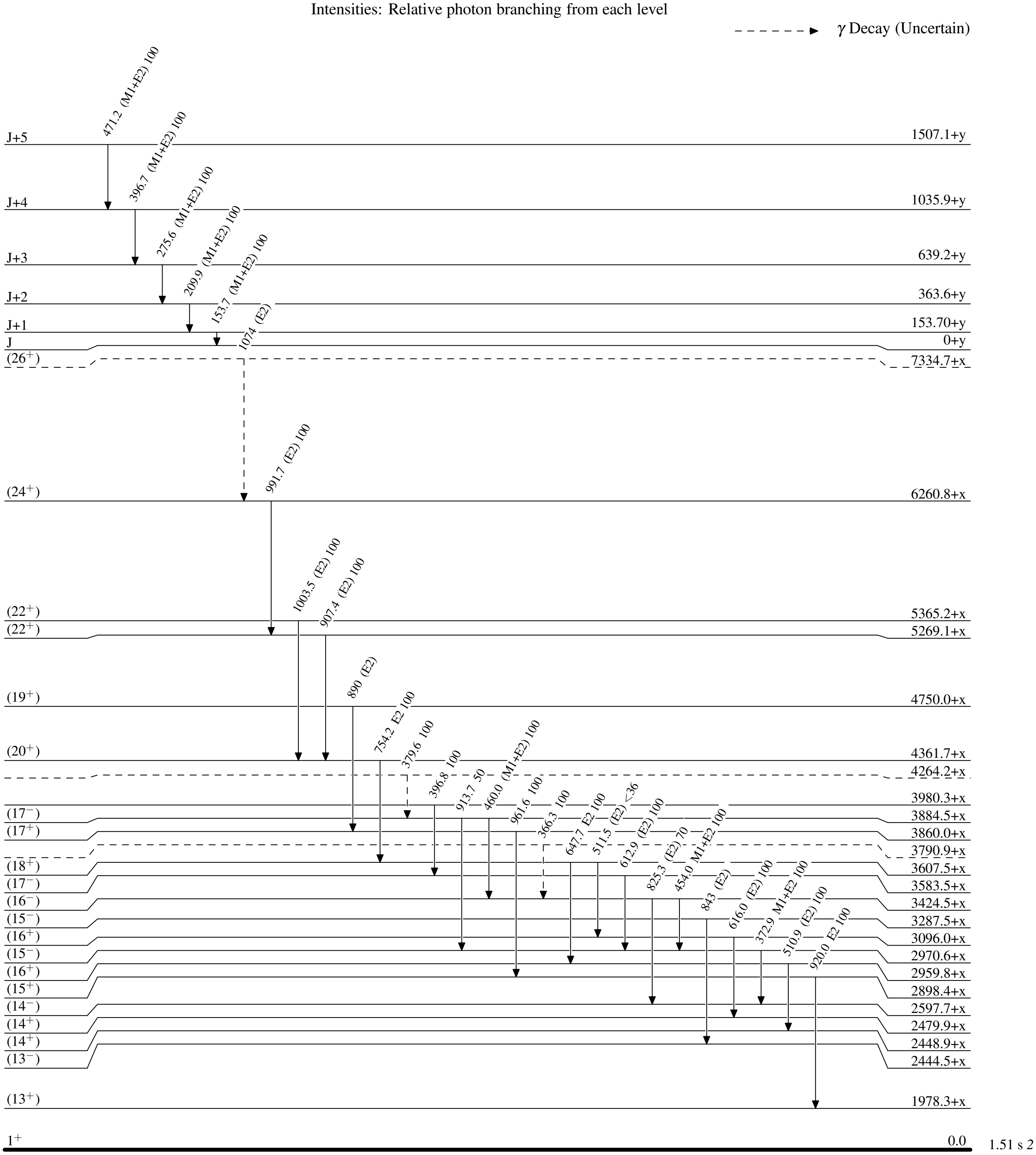
[&] Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

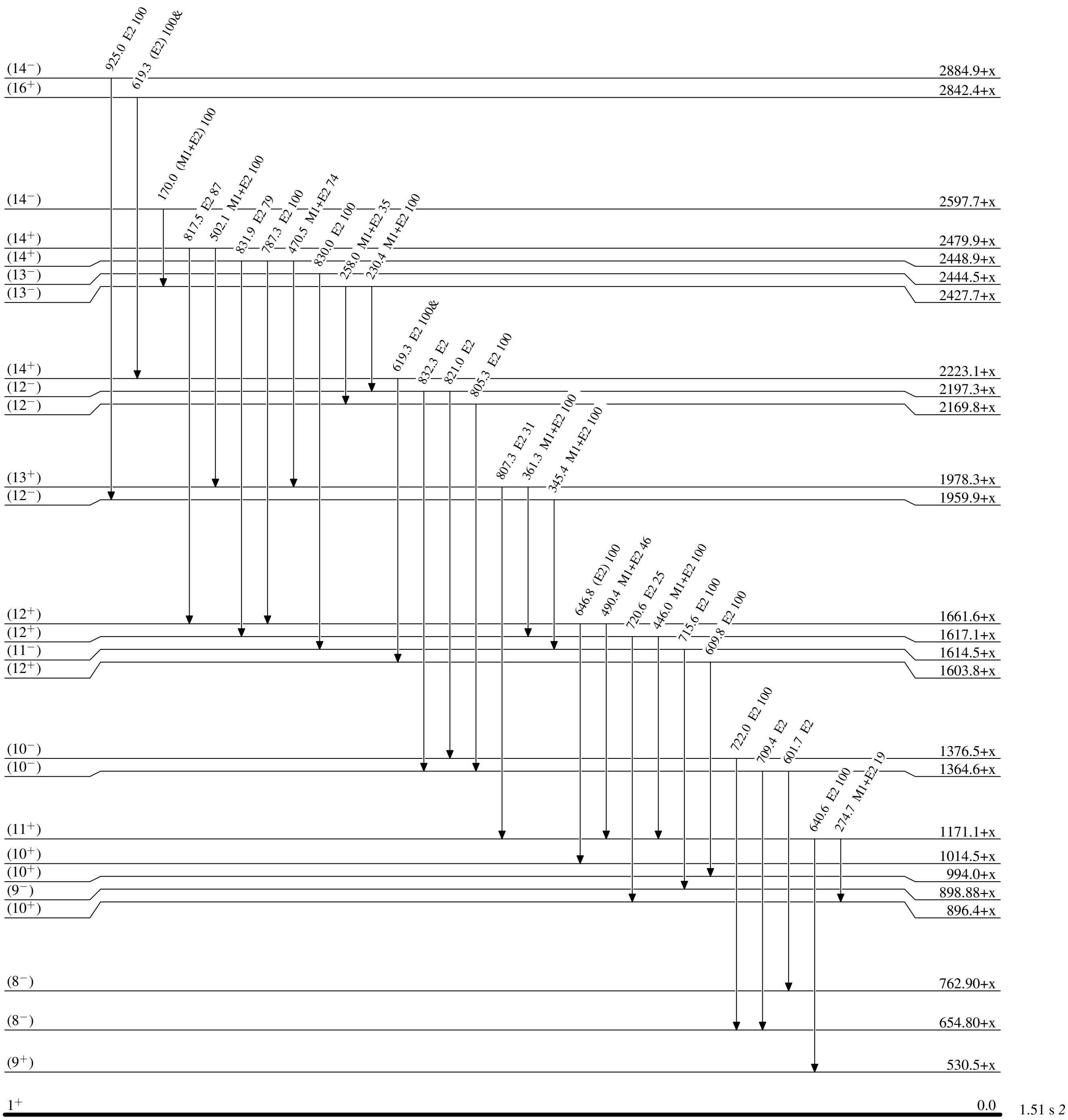


$^{140}_{63}Eu_{77}$

Adopted Levels, Gammas

Level Scheme (continued)

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

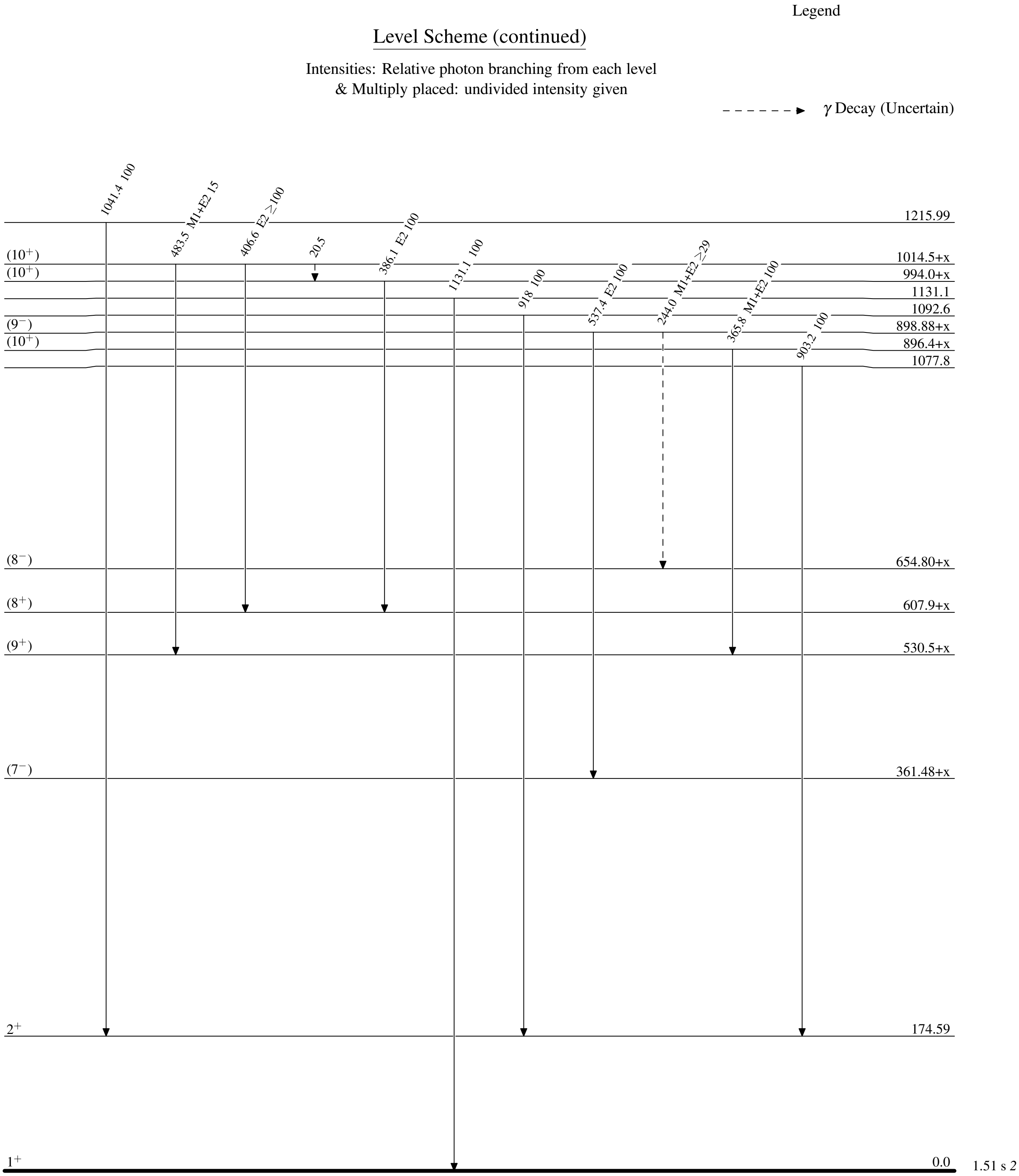


$^{140}_{63}Eu_{77}$

Adopted Levels, Gammas

Level Scheme (continued)

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

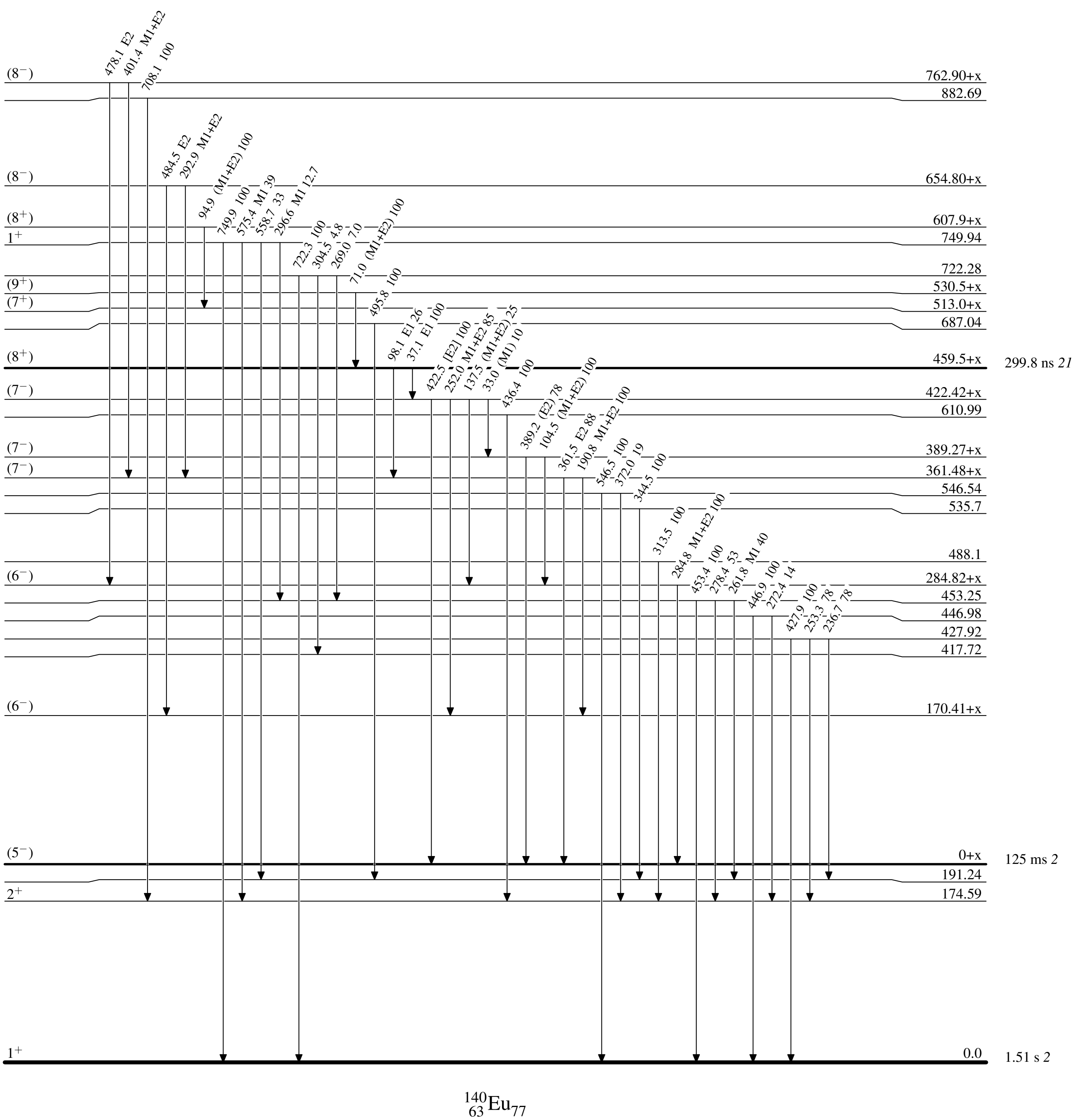


$^{140}_{63}Eu_{77}$

Adopted Levels, Gammas

Level Scheme (continued)

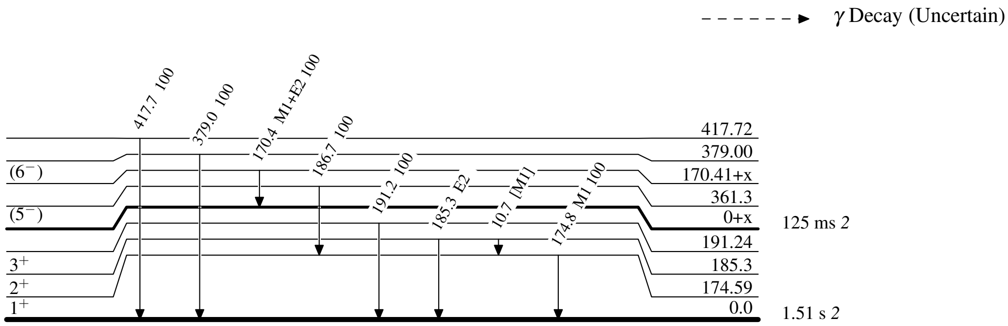
Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given



Adopted Levels, Gammas

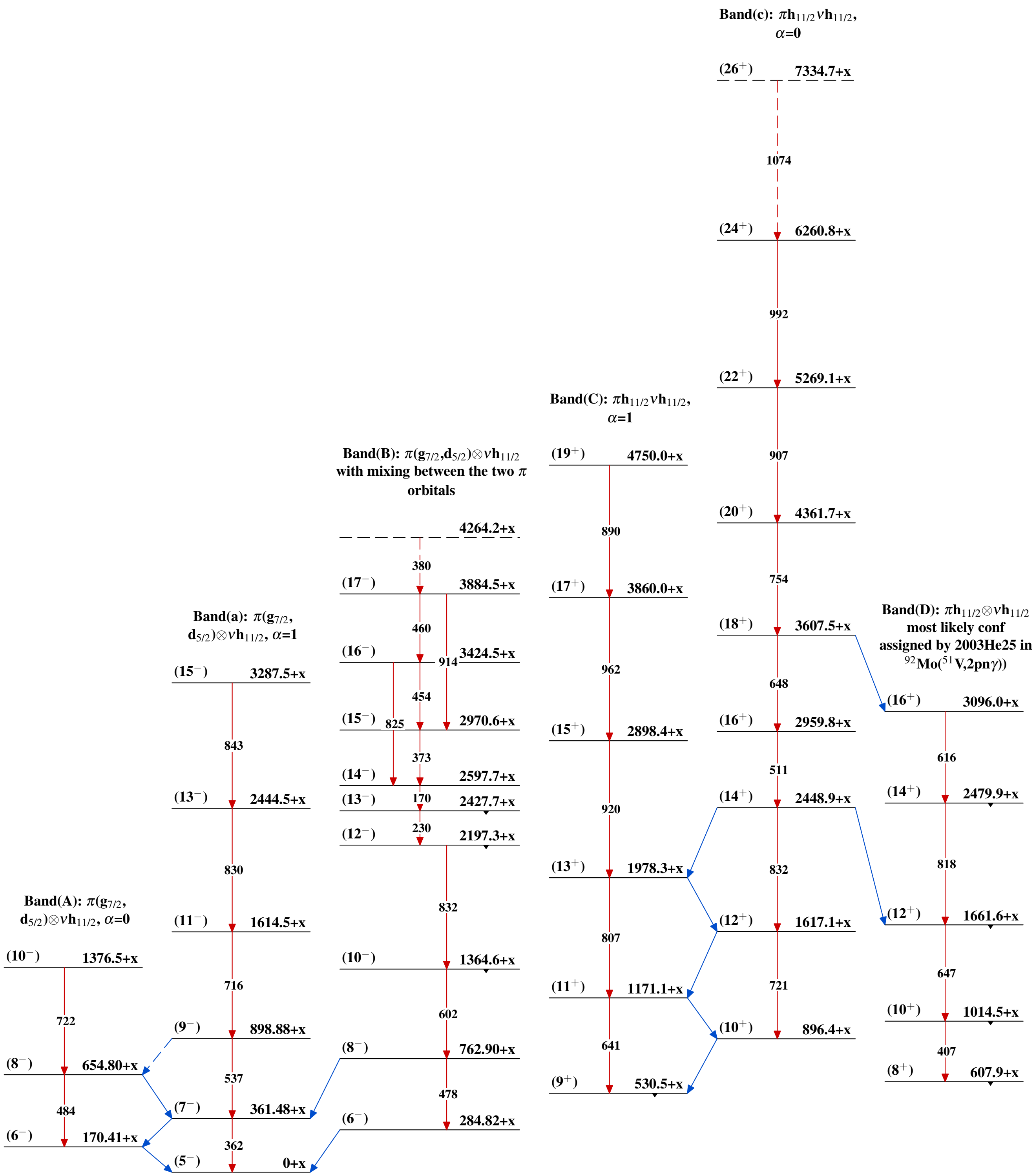
Level Scheme (continued)

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



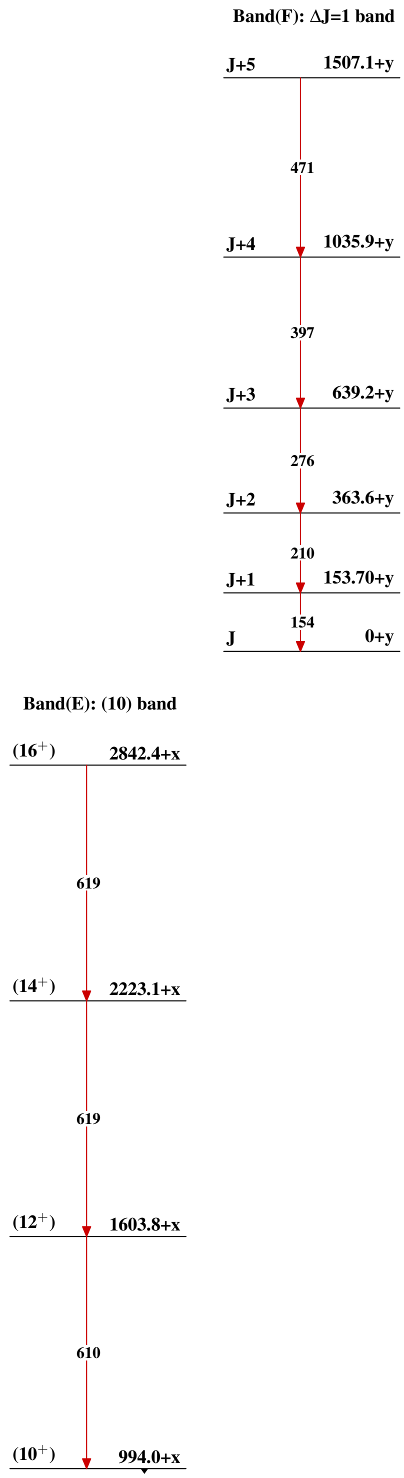
$^{140}_{63}Eu_{77}$

Adopted Levels, Gammas



$^{140}_{63}Eu_{77}$

Adopted Levels, Gammas (continued)



$^{140}_{63}Eu_{77}$