^{252}Cf SF decay 2010Li14,2009Rz02

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	T. D. Johnson, D. Symochko(a), M. Fadil(b), and J. K. Tuli	NDS 112, 1949 (2011)	1-Jun-2010

Parent: ^{252}Cf: E=0.0; $J^\pi=0^+$; $T_{1/2}$=2.645 y *8*; %SF decay=?

2010Li14: Gammasphere detector array. Measured Eγ, γγ, γγ(θ).

2009Rz02: Includes ^{252}Cf SF decay, ^{248}Cm SF decay and ^{235}U(n,F). The data from SF fission of ^{248}Cm and ^{252}Cf obtained with the Eurogam-2 and Gammasphere detector arrays, respectively. LEPSs were used to measure low-energy γ′s. Measured Eγ, Iγ, γγ, γγ(θ), half-lives by delayed timing method. Presence of nanosecond isomer was confirmed with measurements of delayed γ rays following induced fission of ^{235}U carried with the LOHENGRIN mass spectrometer.

Other: 1998Hw04.

218-408-548-702 and 618-387-503 cascades previously assigned to ^{139}Cs (1998Hw04) are reconfirmed as belonging to ^{142}Cs (2010Li14,2009Rz02).

Level scheme is that of 2010Li14; E(level) and Eγ are taken from authors′ level scheme, except γ′s – 25.3-, 26.4- and 9195-keV which are seen only in 2009Rz02.

J^π are based on γγ(θ) measurements and band assignments.

^{142}Cs Levels

E(level)†	J^π	$T_{1/2}$	Comments
0+x	$J^{(-)}$	?	Additional information 1. E(level): most likely this level is not the ground state, since there is no overlap with the data from β-decay of ^{142}Xe.
25.5+x *8*	J+(1^-)		
96.7+x‡ *8*	$J+2^{(-)}$		
122.9+x# *10*	$J+3^{(-)}$	11 ns *3*	$T_{1/2}$: γ timing measurement (2009Rz02).
315.0+x‡ *11*	$J+4^{(-)}$		
328.5+x# *12*	$J+5^{(-)}$		
723.6+x‡ *12*	$J+6^{(-)}$		
733.3+x# *13*	$J+7^{(-)}$		
1072.9+x[a] *12*	$J+5^{(+)}$		
1150.0+x@ *14*	$J+6^{(+)}$		
1272.4+x‡ *14*	$J+8^{(-)}$		
1278.2+x# *14*	$J+9^{(-)}$		
1342.4+x[a] *13*	$J+7^{(+)}$		
1449.1+x@ *14*	$J+8^{(+)}$		
1652.8+x *17*			
1730.0+x[a] *14*	$J+9^{(+)}$		
1793.7+x& *15*			
1862.6+x@ *15*	$J+10^{(+)}$		
1974.5+x‡ *15*	$J+10^{(-)}$		
1978.2+x# *15*	$J+11^{(-)}$		
1995.4+x& *14*			
2233.2+x[a] *15*	$J+11^{(+)}$		
2322.6+x& *16*			
2399.9+x@ *16*	$J+12^{(+)}$		
2730.9+x‡ *18*	$J+12^{(-)}$		
2765.4+x# *18*	$J+13^{(-)}$		
2785.1+x& *16*			
2849.0+x[a] *18*	$J+13^{(+)}$		

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^{252}Cf SF decay 2010Li14,2009Rz02 (continued)

^{142}Cs Levels (continued)

E(level)†	Jπ
3078.4+x@ *19*	J+14(+)
3363.3+x& *19*	
3554.1+x*a* *21*	J+15(+)
3661.6+x# *21*	J+15(−)
3862.1+x@ *21*	J+16(+)
4001.1+x& *22*	

† From least-squares fit to Eγ′s, assuming Δ(Eγ)=0.3 keV.
‡ Band(A): Band based on 96+x.
# Band(B): Band based on 11-ns isomer.
@ Band(C): Band based on 1150+x.
& Band(D): Band based on 1793+x.
a Band(E): Band based on 1073+x.

γ(^{142}Cs)

Angular Correlation Measurements
(Measurements by 2010Li14)

Transitions	A_2	A_4
(218.3γ)(96.9γ)(θ)	0.11 *2*	-0.02 *3*
(544.9γ)(404.8γ)(θ)	0.104 *16*	0.001 *24*
(408.6γ)(218.3γ)(θ)	0.086 *19*	-0.032 *29*
(544.9γ)(404.8γ)(θ)	0.104 *16*	0.001 *24*
(548.8γ)(408.6γ)(θ)	0.093 *25*	-0.010 *39*
(618.8γ)(408.6γ)(θ)	-0.078 *38*	-0.022 *59*
(715.8γ)(404.8γ)(θ)	-0.052 *30*	-0.003 *45*

Eγ	Iγ†	Ei(level)	J^π_i	Ef	J^π_f	Mult.‡	α#	Comments
25.3	22 *7*	25.5+x	J+(1−)	0+x	J(−)			
26.4	51 *8*	122.9+x	J+3(−)	96.7+x	J+2(−)			
71.1	18 *2*	96.7+x	J+2(−)	25.5+x	J+(1−)			
96.9	47 *3*	96.7+x	J+2(−)	0+x	J(−)	E2	2.09	α(K)=1.332 *19*; α(L)=0.597 *9*; α(M)=0.1293 *18*; α(N+..)=0.0293 *5* α(N)=0.0262 *4*; α(O)=0.00308 *5*; α(P)=3.67×10^{-5} *6* Mult.: (M1+E2) is proposed in 2009Rz02 from ambiguous results of angular correlation measurements. E2 from γγ(θ) in 2010Li14 is also preferable due to the systematics of J^π′s values.
97.3	35 *2*	122.9+x	J+3(−)	25.5+x	J+(1−)	(E2)	2.06	α(K)=1.315 *19*; α(L)=0.586 *9*; α(M)=0.1269 *18*; α(N+..)=0.0288 *4* α(N)=0.0257 *4*; α(O)=0.00302 *5*; α(P)=3.63×10^{-5} *5* Mult.: based on the half-life value of the 123 keV level, which rules out M2.
192.1	14 *2*	315.0+x	J+4(−)	122.9+x	J+3(−)			
201.7		1995.4+x		1793.7+x				Eγ: Seen by 2010Li14.

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^{252}Cf SF decay 2010Li14,2009Rz02 (continued)

γ(^{142}Cs) (continued)

E_γ	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	α[#]	Comments
205.6	100 *5*	328.5+x	J+5$^{(-)}$	122.9+x	J+3$^{(-)}$	(E2)	0.1515	α(K)=0.1192 *17*; α(L)=0.0257 *4*; α(M)=0.00542 *8*; α(N+..)=0.001260 *18* α(N)=0.001116 *16*; α(O)=0.0001402 *20*; α(P)=3.81×10^{-6} *6*
218.3	62 *8*	315.0+x	J+4$^{(-)}$	96.7+x	J+2$^{(-)}$	E2	0.1237	α(K)=0.0981 *14*; α(L)=0.0204 *3*; α(M)=0.00429 *6*; α(N+..)=0.000999 *14* α(N)=0.000884 *13*; α(O)=0.0001117 *16*; α(P)=3.17×10^{-6} *5*
255.0		2233.2+x	J+11$^{(+)}$	1978.2+x	J+11$^{(-)}$			
258.7		2233.2+x	J+11$^{(+)}$	1974.5+x	J+10$^{(-)}$			
269.5		1342.4+x	J+7$^{(+)}$	1072.9+x	J+5$^{(+)}$			E_γ: Transition seen only in 2010Li14.
299.1		1449.1+x	J+8$^{(+)}$	1150.0+x	J+6$^{(+)}$			E_γ: Transition only seen in 2010Li14.
327.2	5 *1*	2322.6+x		1995.4+x				
344.4[@]		2322.6+x		1978.2+x	J+11$^{(-)}$			
387.6	7 *1*	1730.0+x	J+9$^{(+)}$	1342.4+x	J+7$^{(+)}$			
395.1	10 *2*	723.6+x	J+6$^{(-)}$	328.5+x	J+5$^{(-)}$			
404.8	71 *4*	733.3+x	J+7$^{(-)}$	328.5+x	J+5$^{(-)}$	E2	0.01725	α(K)=0.01441 *21*; α(L)=0.00227 *4*; α(M)=0.000470 *7*; α(N+..)=0.0001115 *16* α(N)=9.80×10^{-5} *14*; α(O)=1.300×10^{-5} *19*; α(P)=5.08×10^{-7} *8*
408.6	43 *3*	723.6+x	J+6$^{(-)}$	315.0+x	J+4$^{(-)}$	E2	0.01678	α(K)=0.01402 *20*; α(L)=0.00220 *3*; α(M)=0.000456 *7*; α(N+..)=0.0001082 *16* α(N)=9.50×10^{-5} *14*; α(O)=1.262×10^{-5} *18*; α(P)=4.95×10^{-7} *7*
413.5	7 *1*	1862.6+x	J+10$^{(+)}$	1449.1+x	J+8$^{(+)}$			
421.7	0.7 *3*	2399.9+x	J+12$^{(+)}$	1978.2+x	J+11$^{(-)}$			
451.8		1730.0+x	J+9$^{(+)}$	1278.2+x	J+9$^{(-)}$			
457.6		1730.0+x	J+9$^{(+)}$	1272.4+x	J+8$^{(-)}$			
462.5	3 *1*	2785.1+x		2322.6+x				
503.2	5 *1*	2233.2+x	J+11$^{(+)}$	1730.0+x	J+9$^{(+)}$			
537.3	4 *1*	2399.9+x	J+12$^{(+)}$	1862.6+x	J+10$^{(+)}$			
539.1		1272.4+x	J+8$^{(-)}$	733.3+x	J+7$^{(-)}$			
544.9	33 *4*	1278.2+x	J+9$^{(-)}$	733.3+x	J+7$^{(-)}$	E2	0.00744 *11*	α=0.00744 *11*; α(K)=0.00630 *9*; α(L)=0.000910 *13*; α(M)=0.000188 *3*; α(N+..)=4.48×10^{-5} *7* α(N)=3.93×10^{-5} *6*; α(O)=5.31×10^{-6} *8*; α(P)=2.28×10^{-7} *4*
548.8	15 *1*	1272.4+x	J+8$^{(-)}$	723.6+x	J+6$^{(-)}$	E2	0.00730 *11*	α=0.00730 *11*; α(K)=0.00618 *9*; α(L)=0.000892 *13*; α(M)=0.000184 *3*; α(N+..)=4.39×10^{-5} *7* α(N)=3.85×10^{-5} *6*; α(O)=5.20×10^{-6} *8*; α(P)=2.24×10^{-7} *4*
578.2	2 *1*	3363.3+x		2785.1+x				
584.4	3 *1*	1862.6+x	J+10$^{(+)}$	1278.2+x	J+9$^{(-)}$			
609.1	4 *1*	1342.4+x	J+7$^{(+)}$	733.3+x	J+7$^{(-)}$			
615.8	2 *1*	2849.0+x	J+13$^{(+)}$	2233.2+x	J+11$^{(+)}$			
618.8	12 *1*	1342.4+x	J+7$^{(+)}$	723.6+x	J+6$^{(-)}$	E1	0.00192 *3*	α=0.00192 *3*; α(K)=0.001660 *24*; α(L)=0.000205 *3*; α(M)=4.17×10^{-5} *6*; α(N+..)=1.008×10^{-5} *15* α(N)=8.80×10^{-6} *13*; α(O)=1.221×10^{-6} *18*; α(P)=5.99×10^{-8} *9*

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^{252}Cf SF decay 2010Li14,2009Rz02 (continued)

γ(^{142}Cs) (continued)

E_γ	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	α[#]	Comments
637.8		4001.1+x		3363.3+x				
678.5	2 *1*	3078.4+x	J+14$^{(+)}$	2399.9+x	J+12$^{(+)}$			
700.0	10 *1*	1978.2+x	J+11$^{(-)}$	1278.2+x	J+9$^{(-)}$			
702.1	4 *1*	1974.5+x	J+10$^{(-)}$	1272.4+x	J+8$^{(-)}$			
705.1		3554.1+x	J+15$^{(+)}$	2849.0+x	J+13$^{(+)}$			
715.8	11 *1*	1449.1+x	J+8$^{(+)}$	733.3+x	J+7$^{(-)}$	E1	0.001404 *20*	α=0.001404 *20*; α(K)=0.001217 *17*; α(L)=0.0001498 *21*; α(M)=3.04×10^{-5} *5*; α(N+..)=7.35×10^{-6} α(N)=6.42×10^{-6} *9*; α(O)=8.92×10^{-7} *13*; α(P)=4.41×10^{-8} *7*
717.2	4 *1*	1995.4+x		1278.2+x	J+9$^{(-)}$			
744.4		1072.9+x	J+5$^{(+)}$	328.5+x	J+5$^{(-)}$			
756.4		2730.9+x	J+12$^{(-)}$	1974.5+x	J+10$^{(-)}$			
757.9		1072.9+x	J+5$^{(+)}$	315.0+x	J+4$^{(-)}$			
783.7		3862.1+x	J+16$^{(+)}$	3078.4+x	J+14$^{(+)}$			
787.2	3 *1*	2765.4+x	J+13$^{(-)}$	1978.2+x	J+11$^{(-)}$			
806.9	2 *1*	2785.1+x		1978.2+x	J+11$^{(-)}$			
821.5		1150.0+x	J+6$^{(+)}$	328.5+x	J+5$^{(-)}$			
896.2		3661.6+x	J+15$^{(-)}$	2765.4+x	J+13$^{(-)}$			
919.5	2 *1*	1652.8+x		733.3+x	J+7$^{(-)}$			E_γ: Transition seen only in 2009Rz02.
1060.4	2 *1*	1793.7+x		733.3+x	J+7$^{(-)}$			
1262.1		1995.4+x		733.3+x	J+7$^{(-)}$			

[†] From 2009Rz02.
[‡] From γγ(θ) measurements and angular correlations from 2010Li14. a value A_2 = 0.102, A_4 = 0 implies E2 to E2, whereas A_2 = −0.071, A_4 = 0 corresponds to E1 to E2 (from 2010Li14).
[#] 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.
[@] Placement of transition in the level scheme is uncertain.

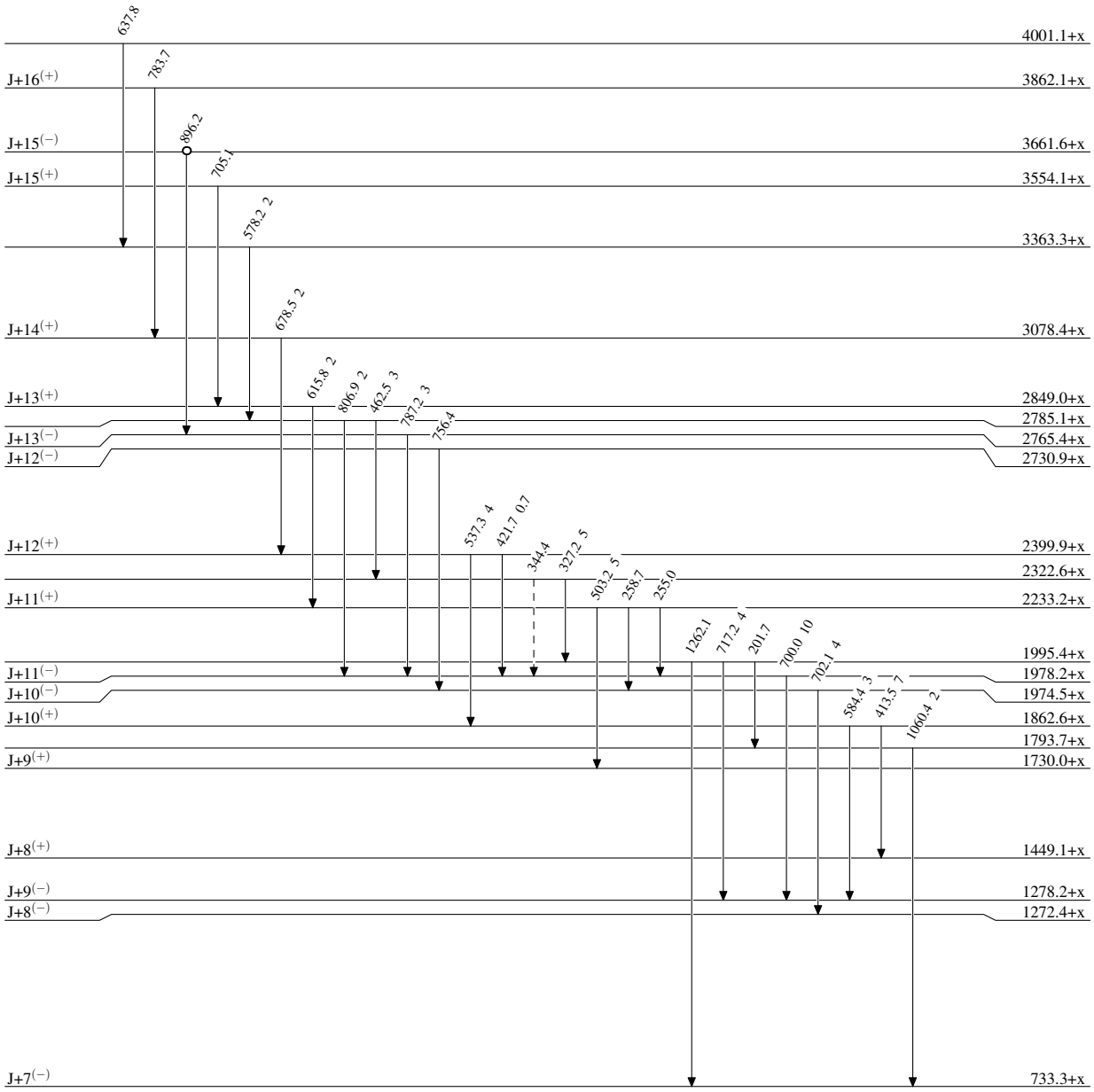
^{252}**Cf SF decay 2010Li14,2009Rz02**

Level Scheme

Intensities: Type not specified

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)
Coincidence
Coincidence (Uncertain)



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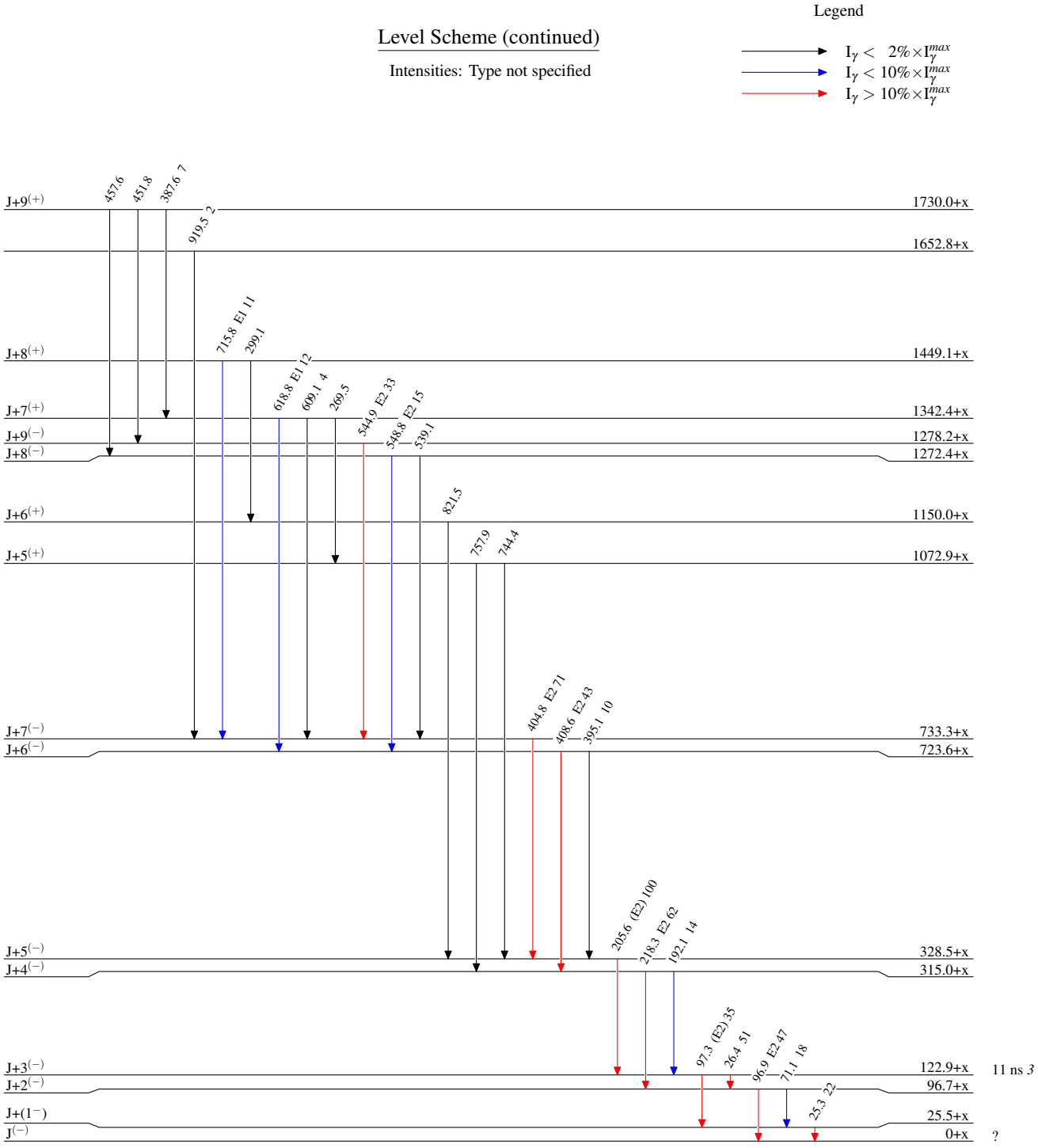
^{252}Cf SF decay 2010Li14,2009Rz02

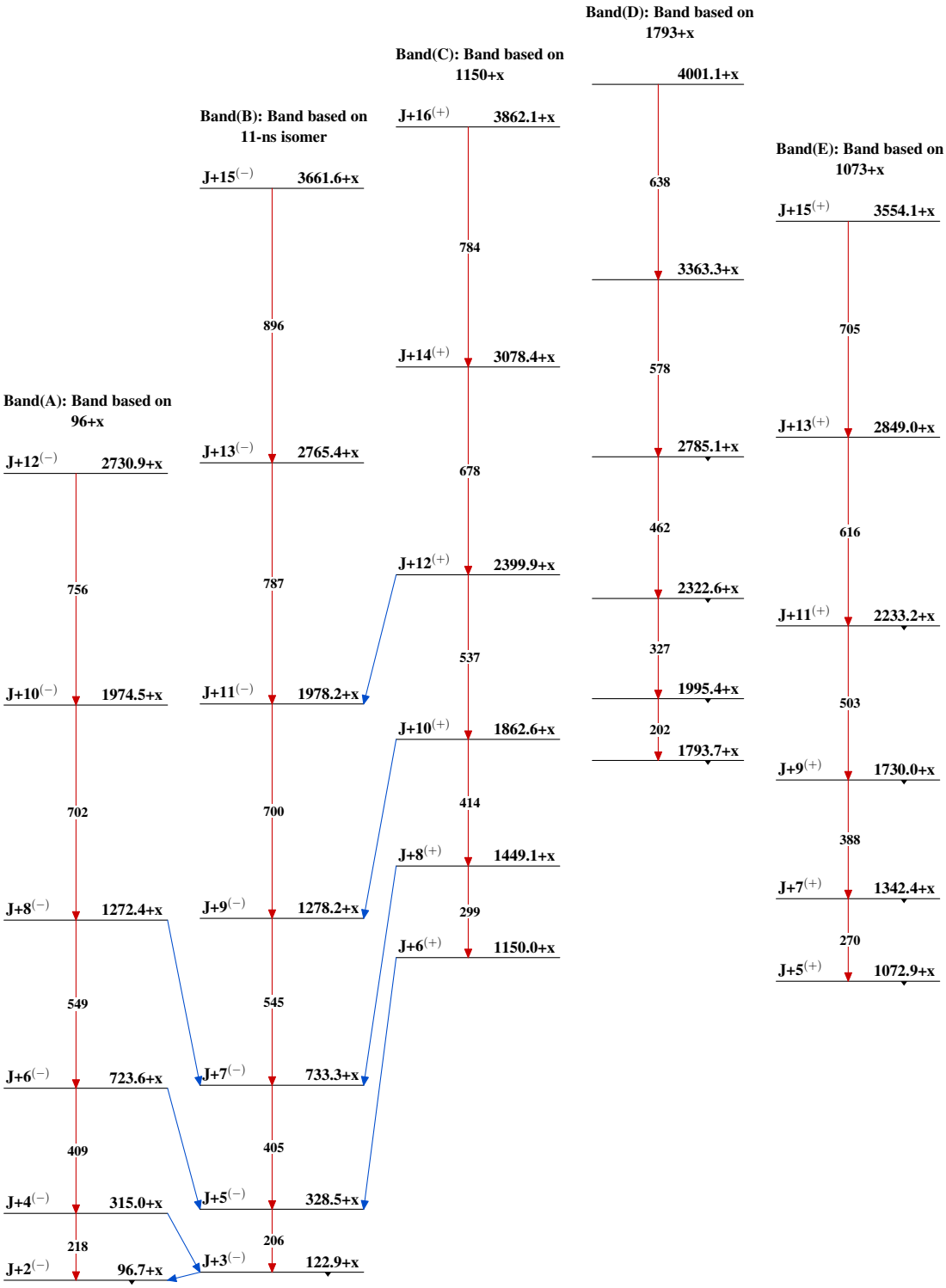
Level Scheme (continued)

Intensities: Type not specified



$^{142}_{55}Cs_{87}$

^{252}Cf SF decay 2010Li14,2009Rz02



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