^{248}Cm,^{252}Cf SF decay 2010Lu02,2004Ur01

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 187,1 (2023)	12-Oct-2022

Parent: ^{248}Cm: E=0.0; $J^\pi=0^+$; $T_{1/2}=3.48\times10^5$ y *6*; %SF decay=8.39 *16*
Parent: ^{252}Cf: E=0.0; $J^\pi=0^+$; $T_{1/2}=2.645$ y *8*; %SF decay=3.092 *8*
Includes ^{254}Cf SF decay.
2010Lu02, 2010LiZZ: ^{252}Cf SF decay. Measured Eγ, Iγ, γγ, γγ(θ) using Gammasphere array with 101 Ge detectors. Deduced parity doublets and evidence of octupole excitations. Identification of γ rays in ^{141}Cs through observation of coincidences with known γ rays in complementary fission fragments of Tc isotopes and by double gating of γ rays in ^{141}Cs.
2004Ur01: ^{248}Cm SF decay. Measured Eγ, Iγ, γγ, γγ(θ) using EUROGAM2 array.
1998Hw04: ^{252}Cf SF decay. Measured γ, γγγ, Gammasphere, 72 Compton- suppressed Ge.
1995Rz01: ^{248}Cm SF decay. Measured γ, γγγ, Xγγ Eurogam, 45 Compton-suppressed Ge, 5 LEPS detectors.
1981SeZW: ^{254}Cf SF decay. Measured fission fragment-γ coin and fragment-fragment coin. Deduced Eγ, Iγ, $T_{1/2}$.
1974ClZX: ^{252}Cf SF decay. Deduced transitions, $T_{1/2}$, fission yields.
Unless given otherwise, all data are from 2010Lu02.

^{141}Cs Levels

No half-lives longer than 10 ns were seen (2004Ur01).
Electric dipole moment $D_0=0.08$ efm *2* from B(E1)/B(E2) ratios (2010Lu02).

E(level)[†]	J^π[‡]	$T_{1/2}$	Comments
0.0[#]	$7/2^+$		J^π: from Adopted Levels, Gammas dataset.
105.90[@] *24*	$5/2^+$	14 ns *1*	$T_{1/2}$: from ^{252}Cf SF decay (1974ClZX).
369.7[#] *3*	$11/2^+$		
389.00[@] *22*	$9/2^+$		
850.7[#] *4*	$15/2^+$		
862.4[@] *3*	$13/2^+$		
1482.9[#] *4*	$19/2^+$		
1488.9[@] *4*	$17/2^+$		
1549.9[&] *4*	$(15/2^-)$		
1577.2 *5*			Level observed by 2010Lu02 but not by 2004Ur01.
1632.3[a] *4*	$(17/2^-)$		
1661.0 *4*	(17/2)		
1941.5[&] *4*	$(19/2^-)$		B(E1)(452.6γ)/B(E2)(391.6γ)=1.20×10^{-6} fm^{-2} *22* (2010Lu02).
2000.8[b] *4*	(19/2)		
2086.8[a] *4*	$21/2^{(-)}$		B(E1)(603.9γ)/B(E2)(454.4γ)=0.31×10^{-6} fm^{-2} *8* (2010Lu02).
2113.5[@] *4*	$21/2^+$		
2131.3[#] *4*	$23/2^+$		
2285.4 *5*	$(23/2^+)$		
2466.0[&] *4*	$(23/2^-)$		B(E1)(352.5γ)/B(E2)(524.5γ)=0.47×10^{-6} fm^{-2} *9* (2010Lu02).
2649.5[b] *4*	(23/2)		
2675.5[a] *4*	$25/2^{(-)}$		B(E1)(544.2γ)/B(E2)(588.7γ)=0.21×10^{-6} fm^{-2} *5* (2010Lu02).
2784.6[@] *5*	$(25/2^+)$		
2789.5[#] *5*	$(27/2^+)$		
2994.9[&] *4*	$(27/2^-)$		J^π: 21/2 in table 3 of 2010Lu02 is a misprint. B(E1)(210.3γ)/B(E2)(528.9γ)=1.11×10^{-6} fm^{-2} *21* (2010Lu02).
3056.6 *5*	$(27/2^+)$		

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^{248}Cm,^{252}Cf SF decay 2010Lu02,2004Ur01 (continued)

^{141}Cs Levels (continued)

E(level)[†]	J$^{\pi}$[‡]	Comments
3332.8[b] 5	(27/2)	
3345.5[a] 5	29/2$^{(-)}$	B(E1)(555.9γ)/B(E2)(670.0γ)=0.22×10^{-6} fm^{-2} 8 (2010Lu02). J$^{\pi}$: 27/2 in table 2 of 2010Lu02 is a misprint.
3501.8[#] 6	(31/2^{+})	
3504.5[@] 6	(29/2^{+})	
3603.2[&] 5	(31/2^{-})	
4273.0[&] 6	(35/2^{-})	
4345.7[#] 7	(35/2^{+})	

[†] From least-squares fit to Eγ's (by evaluator), assuming ΔEγ=0.3 keV for each γ ray.
[‡] From 2010Lu02 based on measured multipolarities (some assignments might differ from those in Adopted Levels, Gammas dataset).
[#] Band(A): Band 1: simplex=−i, π=+ and g.s. band.
[@] Band(B): Band 2: simplex=+i, π=+ band.
[&] Band(C): Band 3: simplex=+i, π=− band.
[a] Band(D): Band 4: simplex=−i, π=− band.
[b] Band(E): Band 5: based on (19/2).

γ(^{141}Cs)

E$_{\gamma}$	I$_{\gamma}$[†]	E$_i$(level)	J$_i^{\pi}$	E$_f$	J$_f^{\pi}$	Mult.[‡]	Comments
[x]68.8[#] 1							
[x]75.6[@a]							T$_{1/2}$=0.55 ns 15 (1981SeZW).
[x]76.5[#a]							T$_{1/2}$=10 ns 1 (1974ClZX). T$_{1/2}$=1.8 ns 3 (1981SeZW).
[x]89.9[#a]							T$_{1/2}$=12 ns 1 (1974ClZX). The discrepancy between T$_{1/2}$ for 89.9γ in ^{141}Xe β^- decay (<2.1 ns) and in ^{252}Cf SF decay (12 ns) suggests that this γ may be a doublet with unknown placement of T$_{1/2}$=12 ns component.
[x]96.1[#a]							T$_{1/2}$=12 ns 3 (1974ClZX).
105.9	15 2	105.90	5/2^{+}	0.0	7/2^{+}	M1+E2	α(exp)=1.5 2 Mult.: α(exp) from intensity balance consistent with mult=M1+E2 (2004Ur01); ΔJ=2 transition given in table I of 2004Ur01 seems a misprint since negative A$_2$ is expected for ΔJ=1 transition; A$_2$=−0.10 3, A$_4$=+0.07 4 for (105γ)(283γ)(θ) (2004Ur01).
[x]117.9[@a]							T$_{1/2}$=4.0 ns 5 (1981SeZW).
198.6[a]		2285.4	(23/2^{+})	2086.8	21/2$^{(-)}$		
210.3	0.29 10	2994.9	(27/2^{-})	2784.6	(25/2^{+})		I$_{\gamma}$: from Iγ(528.9γ) (2004Ur01) and branching ratio (2010Lu02).
270.4		3603.2	(31/2^{-})	3332.8	(27/2)		I$_{\gamma}$: branching ratio <8.4% (2010Lu02).
283.1	14 1	389.00	9/2^{+}	105.90	5/2^{+}	E2	Mult.: ΔJ=2 transition from A$_2$=+0.12 2, A$_4$=−0.08 6 for (283γ)(473γ)(θ) (2004Ur01).
288.9[a]		3345.5	29/2$^{(-)}$	3056.6	(27/2^{+})		
339.8	0.9 3	2000.8	(19/2)	1661.0	(17/2)		The placement of this γ ray is considered uncertain by 2004Ur01.
345.4	0.26 9	2994.9	(27/2^{-})	2649.5	(23/2)		I$_{\gamma}$: from Iγ(528.9γ) (2004Ur01) and branching ratio (2010Lu02).

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^{248}Cm,^{252}Cf SF decay 2010Lu02,2004Ur01 (continued)

γ(^{141}Cs) (continued)

E_γ	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	Comments
352.5	1.2 *3*	2466.0	$(23/2^-)$	2113.5	$21/2^+$		
369.7	100 *5*	369.7	$11/2^+$	0.0	$7/2^+$		
381.1		3056.6	$(27/2^+)$	2675.5	$25/2^{(-)}$		I_γ: branching ratio 96% (2010Lu02).
389.0	35 *2*	389.00	$9/2^+$	0.0	$7/2^+$	D	Mult.: ΔJ=0,1 transition from A_2=−0.07 *2*, A_4=+0.06 *4* for (389γ)(473γ)(θ) (2004Ur01); A_2=−0.090 *11*, A_4=−0.014 *17* (2010Lu02, same cascade).
390.1	0.27 *7*	2675.5	$25/2^{(-)}$	2285.4	$(23/2^+)$		I_γ: from Iγ(588.7γ) (2004Ur01) and branching ratio (2010Lu02).
391.6	0.5 *2*	1941.5	$(19/2^-)$	1549.9	$(15/2^-)$		The placement of this γ ray is considered uncertain by 2004Ur01.
452.5	0.93 *11*	2113.5	$21/2^+$	1661.0	(17/2)		I_γ: from Iγ(624.6γ) (2004Ur01) and branching ratio (2010Lu02).
452.6	4.2 *3*	1941.5	$(19/2^-)$	1488.9	$17/2^+$	D	ΔJ=0,1 transition from A_2=−0.08 *4*, A_4=+0.05 *6* for (452.6γ)(626.5γ)(θ) (2010Lu02), and A_2=−0.06 *2*, A_4=+0.04 *4* for (453γ)(626γ)(θ) (2004Ur01).
454.5	1.9 *5*	2086.8	$21/2^{(-)}$	1632.3	$(17/2^-)$		
465.2	0.8 *2*	2466.0	$(23/2^-)$	2000.8	(19/2)		
473.4	36 *2*	862.4	$13/2^+$	389.00	$9/2^+$		
481.0	64 *4*	850.7	$15/2^+$	369.7	$11/2^+$	E2	Mult.: ΔJ=2 transition from A_2=+0.101 *9*, A_4=+0.013 *14* for (481.0γ)(369.7γ)(θ) (2010Lu02), and from A_2=+0.09 *2*, A_4=−0.04 *2* for (481γ)(370γ)(θ) (2004Ur01).
492.7	11.0 *6*	862.4	$13/2^+$	369.7	$11/2^+$	D	Mult.: ΔJ=0,1 transition from A_2=−0.11 *3*, A_4=+0.08 *5* for (493γ)(370γ)(θ) (2004Ur01).
511.9	4.5 *3*	2000.8	(19/2)	1488.9	$17/2^+$		
517.9	4.0 *4*	2000.8	(19/2)	1482.9	$19/2^+$		
518.2	0.27 *6*	2649.5	(23/2)	2131.3	$23/2^+$		I_γ: from Iγ(648.7γ) (2004Ur01) and branching ratio (2010Lu02).
524.5	3.8 *4*	2466.0	$(23/2^-)$	1941.5	$(19/2^-)$		
528.9	0.9 *3*	2994.9	$(27/2^-)$	2466.0	$(23/2^-)$	E2	Mult.: ΔJ=2 transition from A_2=+0.13 *5*, A_4=−0.06 *8* for (528.9γ)(524.5γ)(θ) (2010Lu02).
544.2	1.2 *3*	2675.5	$25/2^{(-)}$	2131.3	$23/2^+$		
555.9		3345.5	$29/2^{(-)}$	2789.5	$(27/2^+)$		I_γ: branching ratio 36.3% (2010Lu02).
588.7	1.9 *5*	2675.5	$25/2^{(-)}$	2086.8	$21/2^{(-)}$		
603.9	8.5 *5*	2086.8	$21/2^{(-)}$	1482.9	$19/2^+$	D	Mult.: ΔJ=1, D transition from A_2=−0.11 *3*, A_4=0.00 *4* for (603.9γ)(632.2γ)(θ) (2010Lu02); other: A_2=−0.07 *2*, A_4=+0.01 *3* for (604γ)(summed γ)(θ) (2004Ur01).
608.3	&	3603.2	$(31/2^-)$	2994.9	$(27/2^-)$		
624.6	4.4 *5*	2113.5	$21/2^+$	1488.9	$17/2^+$	E2	Mult.: ΔJ=2 transition from A_2=+0.11 *4*, A_4=+0.01 *7* for (624.6γ)(626.5γ)(θ) (2010Lu02).
626.5	18 *1*	1488.9	$17/2^+$	862.4	$13/2^+$	E2	Mult.: ΔJ=2 transition from A_2=+0.105 *21*, A_4=+0.03 *3* for (626.5γ)(473.4γ)(θ) (2010Lu02), and A_2=+0.08 *2*, A_4=−0.04 *4* for (626γ)(summed γ)(θ) (2004Ur01).
630.6	0.16 *2*	2113.5	$21/2^+$	1482.9	$19/2^+$		
632.2	33 *2*	1482.9	$19/2^+$	850.7	$15/2^+$	E2	Mult.: ΔJ=2 transition from A_2=+0.105 *12*, A_4=+0.023 *19* for (632.2γ)(481.0γ)(θ) (2010Lu02), and from A_2=+0.10 *2*, A_4=−0.07 *4* for (632γ)(summed γ)(θ) (2004Ur01).
638.2	0.97 *5*	1488.9	$17/2^+$	850.7	$15/2^+$		I_γ: from Iγ(626.5γ) (2004Ur01) and branching ratio (2010Lu02).
648.4	11.2 *7*	2131.3	$23/2^+$	1482.9	$19/2^+$	E2	Mult.: ΔJ=2 transition from A_2=+0.095 *14*, A_4=+0.017 *21* for (648.4γ)(632.2γ)(θ) (2010Lu02), and A_2=+0.11 *3*, A_4=−0.03 *3* from (648γ)(summed γ)(θ) (2004Ur01).
648.7	1.8 *4*	2649.5	(23/2)	2000.8	(19/2)		

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^{248}Cm,^{252}Cf SF decay 2010Lu02,2004Ur01 (continued)

$\gamma(^{141}Cs)$ (continued)

E_γ	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	Comments
658.2	4.2 *4*	2789.5	$(27/2^+)$	2131.3	$23/2^+$		
669.8	&	4273.0	$(35/2^-)$	3603.2	$(31/2^-)$		
670.0	&	3345.5	$29/2^{(-)}$	2675.5	$25/2^{(-)}$		
671.1	1.0 *2*	2784.6	$(25/2^+)$	2113.5	$21/2^+$		
683.3	&	3332.8	(27/2)	2649.5	(23/2)		
687.5	1.5 *3*	1549.9	$(15/2^-)$	862.4	$13/2^+$		
712.3	&	3501.8	$(31/2^+)$	2789.5	$(27/2^+)$		
719.9	&	3504.5	$(29/2^+)$	2784.6	$(25/2^+)$		
726.5	&	1577.2		850.7	$15/2^+$		
771.2	&	3056.6	$(27/2^+)$	2285.4	$(23/2^+)$		
781.6	3.6 *4*	1632.3	$(17/2^-)$	850.7	$15/2^+$		
802.5	&	2285.4	$(23/2^+)$	1482.9	$19/2^+$		
810.3	2.8 *5*	1661.0	(17/2)	850.7	$15/2^+$	D	Mult.: ΔJ=0,1 transition from A_2=−0.14 *3*, A_4=+0.06 *3* for (810γ)(summed γ)(θ) (2004Ur01).
843.9	&	4345.7	$(35/2^+)$	3501.8	$(31/2^+)$		

[†] Relative intensities from 2004Ur01, except when noted otherwise.
[‡] From angular correlations measured by 2004Ur01 and 2010Lu02. Mult=Q is E2 since $T_{1/2}$(level)<10 ns for ΔJ=2; mult=D for ΔJ=1 or 0.
[#] From ^{252}Cf SF decay (1974ClZX).
[@] From ^{254}Cf SF decay (1981SeZW).
[&] Only branching ratio of 100% is given for this transition (2010Lu02).
[a] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

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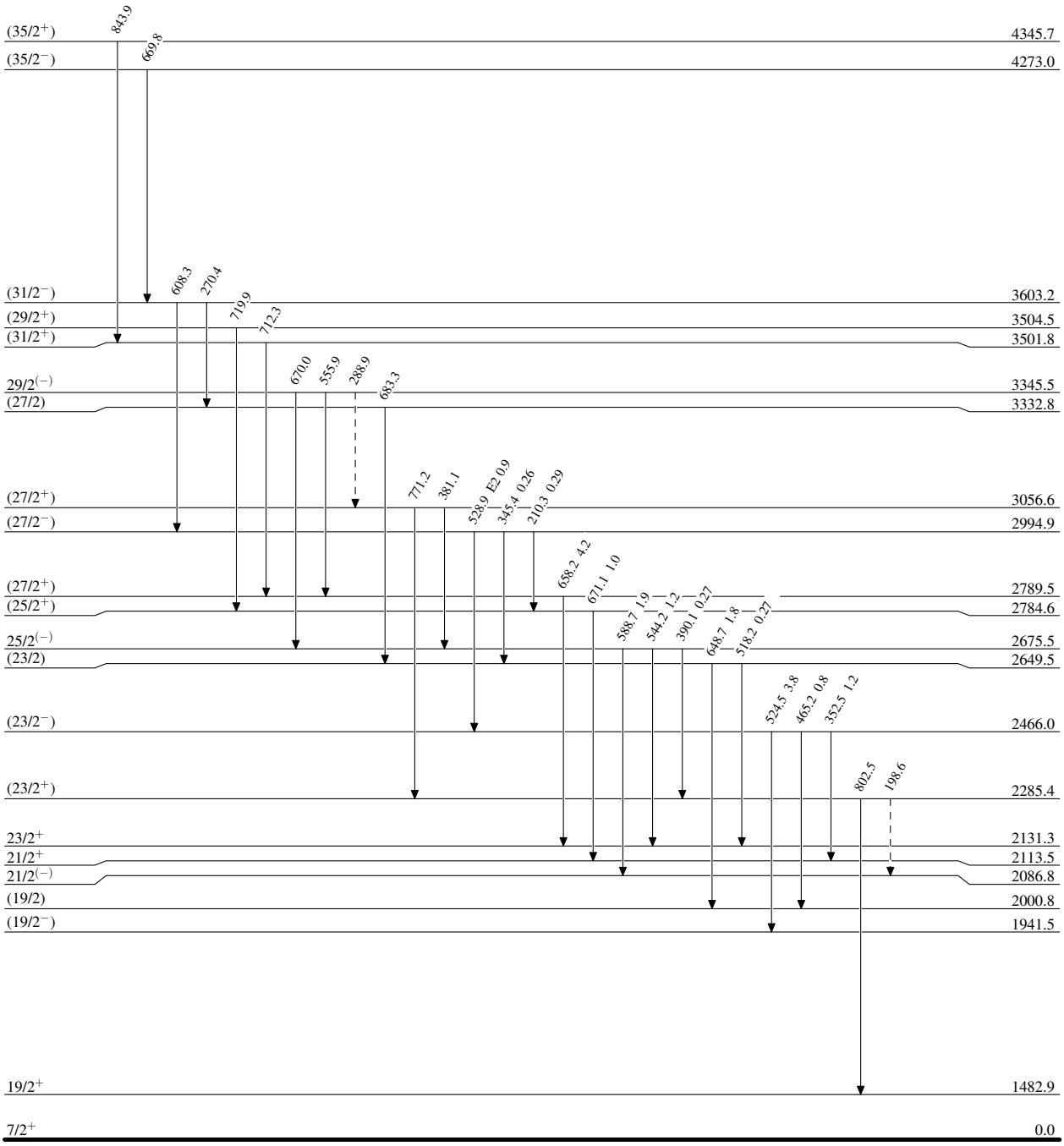
Level Scheme

Intensities: Relative I_γ

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)

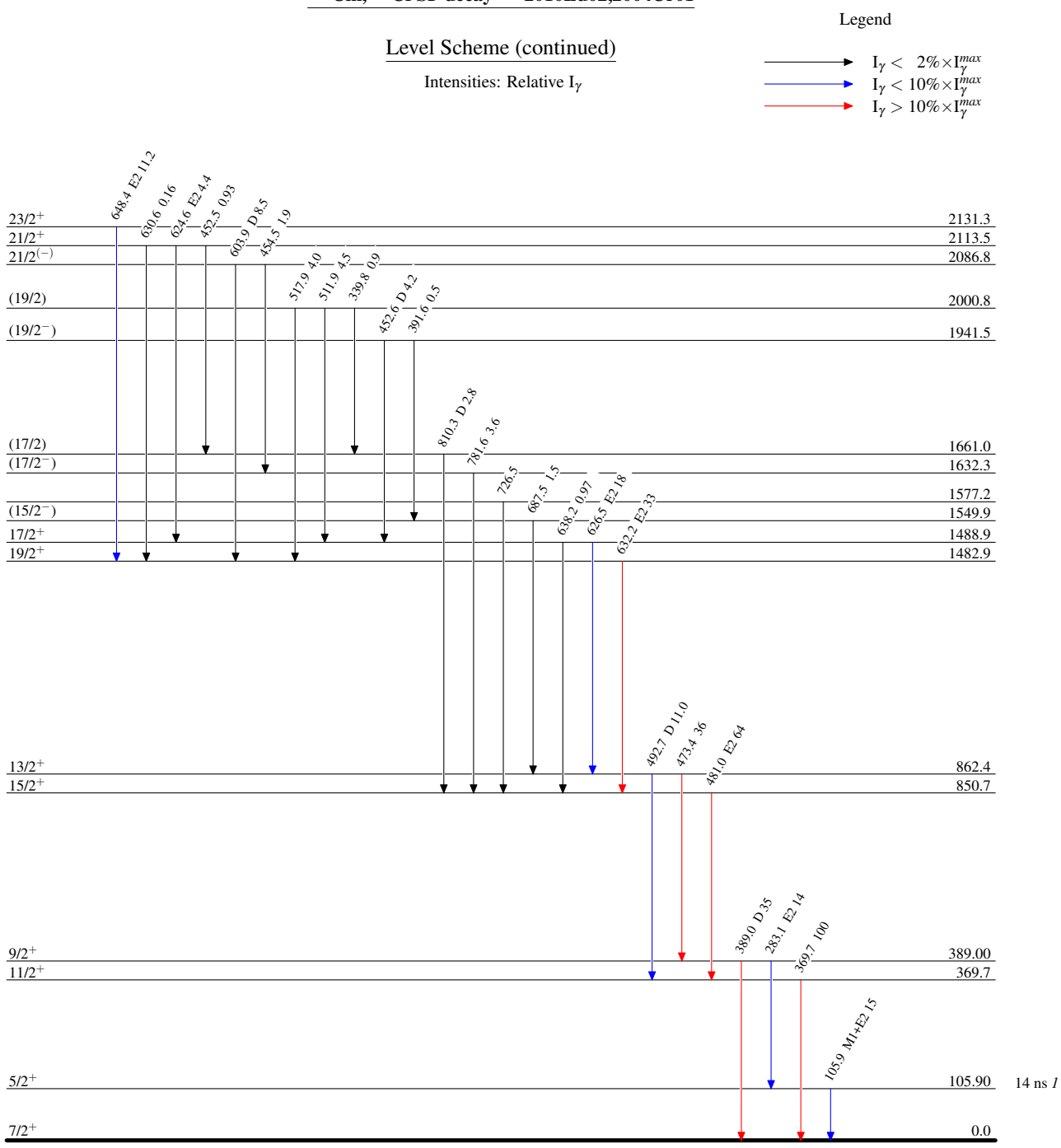


$^{141}_{55}Cs_{86}$

^{248}Cm,^{252}Cf SF decay 2010Lu02,2004Ur01

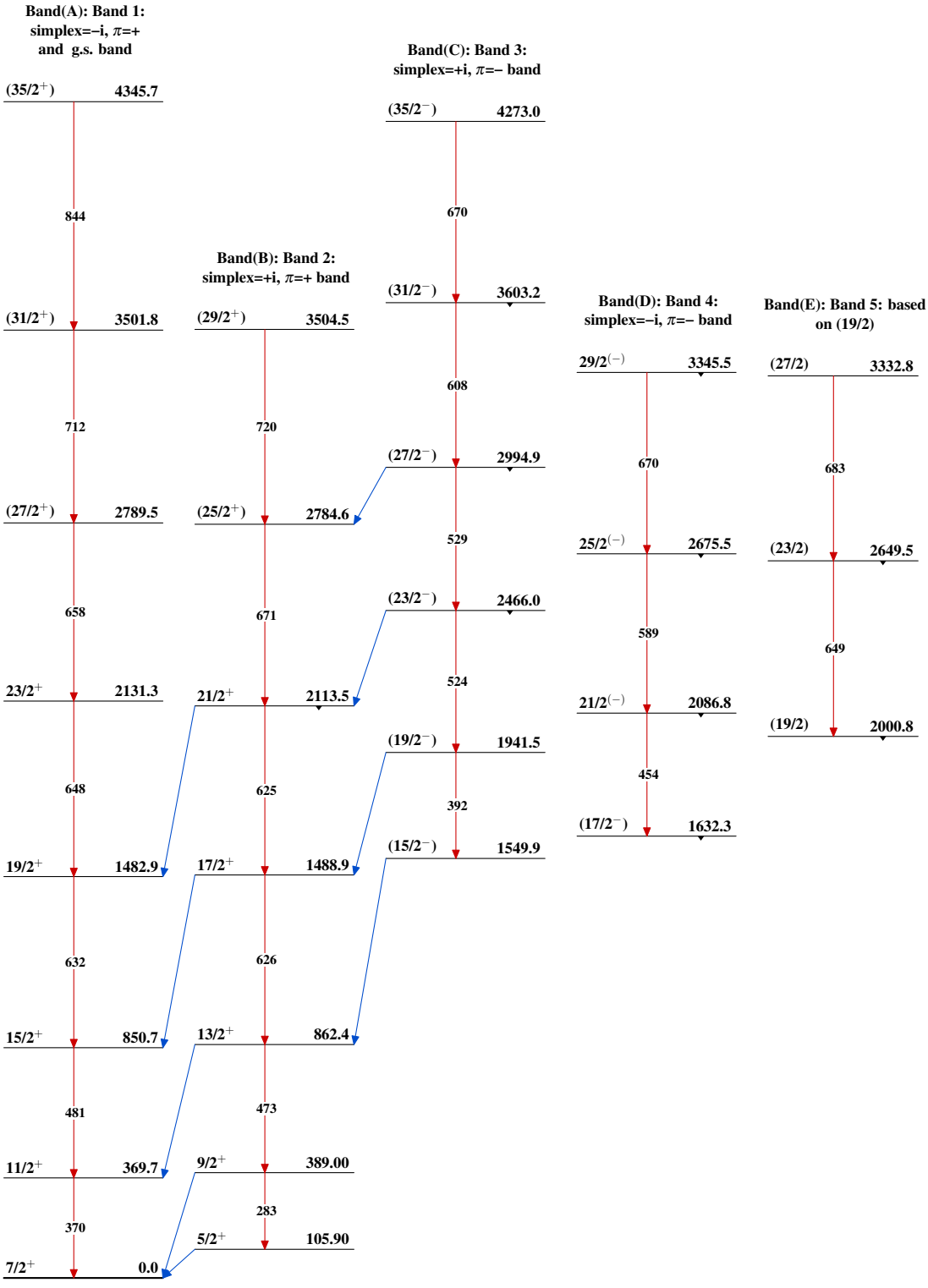
Level Scheme (continued)

Intensities: Relative I_γ



$^{141}_{55}Cs_{86}$

^{248}Cm,^{252}Cf SF decay 2010Lu02,2004Ur01



$^{141}_{55}Cs_{86}$