^{250}Es ε decay (8.6 h)

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Y. Akovali	NDS 94,131 (2001)	1-Aug-2001

Parent: ^{250}Es: E=0.0; J^π=(6$^+$); $T_{1/2}$=8.6 h *1*; Q(ε)=2100 *SY*; %ε+%β^+ decay=98.5 *15*

^{250}Cf Levels

E(level)	J^π	E(level)	J^π	E(level)	J^π	E(level)	J^π
0.0	0$^+$	871.57 *3*	2$^-$	1071.37 *2*	3$^+$	1396.09 *7*	(5)$^-$
42.721 *5*	2$^+$	905.89 *2*	3$^-$	1255.39 *4*	4$^-$	1457.76 *4*	(6)$^-$
141.875 *10*	4$^+$	951.98 *2*	4$^-$	1311.00 *4*	5$^-$	1478.37 *4*	(5)$^-$
296.22 *6*	6$^+$	1008.51 *2*	5$^-$	1377.76 *4*	(6)$^-$	1499.53 *4*	(6)$^-$

ε,β^+ radiations

E(decay)	E(level)	Iε †‡	Log *ft*	I($\varepsilon+\beta^+$) ‡	Comments
(600 *SY*)	1499.53	42 *4*	6.35 *20*	42 *4*	εK=0.687 *24*; εL=0.227 *16*; εM+=0.086 *8*
(621 *SY*)	1478.37	54 *2*	6.27 *19*	54 *2*	εK=0.691 *21*; εL=0.224 *15*; εM+=0.085 *7*
(642 *SY*)	1457.76	10 *5*	7.0 *3*	10 *5*	εK=0.694 *20*; εL=0.222 *14*; εM+=0.084 *6*
(703# *SY*)	1396.09				
(789# *SY*)	1311.00				

† Deduced from intensity balance At each level. The branches sum to 106% 7.
‡ For absolute intensity per 100 decays, multiply by 0.985 *15*.
# Existence of this branch is questionable.

^{250}Es ε decay (8.6 h) (continued)

$\gamma(^{250}$Cf)

No α decay from the ^{250}Es g.s. was observed, and an upper limit of 3% was given by 1970Ah01. The ε decay branch of %ε>97 is adopted for ^{250}Es g.s. for the absolute intensity normalization factor, the ε branching appear here As 98.5% 15, rather than the adopted branchings of %ε>97.

The sum of x-ray intensity due to εK branchings and K-electron conversions is calculated to Be Kα_1 x ray=46, Kα_2 x ray=74.

Californium x-rays (1977Fr03):

E(x-ray)	I(x-ray) %ε Decay	
109.82 5	46.2 23	Kα_2 x ray
115.05 5	73.4 37	Kα_1 x ray
128.6 1		Kβ_3 x ray
	30.6 15	Kβ_1' x ray
129.8 1		Kβ_1 x ray
133.66 10	10.3 5	Kβ_2' x ray

E_γ[†]	I_γ[‡&]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[#]	α[a]	$I_{(\gamma+ce)}$[@&]	Comments
34.325 *5*	≈0.06	905.89	3^-	871.57	2^-	M1+E2	0.42 *5*	7.4×10^2 *11*	48.5 *25*	α(L)=545 *80*; α(M)=149 *23* I_γ: total intensity of 48.5 *25* and $\alpha=7.4\times10^2$ *11* give Iγ=0.066 *11*.
41.775 *5*	0.29 *3*	1499.53	$(6)^-$	1457.76	$(6)^-$	M1+E2	0.14 *+7−14*	144 *30*	35 *4*	α(L)=107 *22*; α(M)=27 *6*
42.721 *5*	0.09 *1*	42.721	2^+	0.0	0^+	E2		1293	100 *5*	α(L)=939; α(M)=266
46.093 *5*	0.19 *2*	951.98	4^-	905.89	3^-	M1+E2	0.40 *2*	200 *10*	32.8 *15*	α(L)=147 *7*; α(M)=39.6 *21*
55.602 *5*	0.20 *2*	1311.00	5^-	1255.39	4^-	M1+E2	0.59 *5*	133 *9*	22.9 *20*	α(L)=96 *8*; α(M)=26.3 *22*; α(N+..)=10.4 *9*
56.527 *13*	0.09 *1*	1008.51	5^-	951.98	4^-	M1+E2	0.37 *+20−10*	80 *40*	5.5 *5*	α(L)=60 *30*; α(M)=16 *8*; α(N+..)=6 *3*
61.667 *5*	0.85 *7*	1457.76	$(6)^-$	1396.09	$(5)^-$	M1+E2	0.20 *3*	45.1 *16*	39 *2*	α(L)=33.3 *16*; α(M)=8.5 *5*; α(N+..)=3.29 *19*
66.759 *10*	0.05 *2*	1377.76	$(6)^-$	1311.00	5^-	M1(+E2)	≤0.5	37 *7*	1.9 *9*	α(L)=31 *9*; α(M)=8 *3*; α(N+..)=3.2 *11* δ: E2 admixture of≤20% listed In 1977Fr03 was determined from L1/L3=0.6 *1*/<0.3. The L2 line was masked. α(L1)(exp)=0.6 *1*/0.05 *2*=12 *6* gives δ=0.9 *+12−6*. $I_{(\gamma+ce)}$: transition intensity is listed As (1.0-1.9) by 1977Fr03. Since the intensity balance At the 1377.85 level requires Ti(66.759γ)≥Ti(79.998γ), the higher number is given here.
79.998 *30*	0.11 *3*	1457.76	$(6)^-$	1377.76	$(6)^-$	(M1+E2)	<0.3	18.7 *11*	≈2.3	α(L)=13.9 *20*; α(M)=3.5 *6*; α(N+..)=1.35 *24*
80.412 *10*	0.29 *3*	951.98	4^-	871.57	2^-	E2		63.3	18.6 *20*	α(L)=45.2; α(M)=12.9; α(N+..)=5.14 $I_{(\gamma+ce)}$: 1977Fr03 listed I(γ+ce)=12.9 *15* by adding expected L1, L2, M2 and higher shell

γ(^{250}Cf) (continued)

E_γ [†]	I_γ [‡&]	E_i(level)	J^π_i	E_f	J^π_f	Mult. [#]	δ [#]	α [a]	$I_{(\gamma+ce)}$ [@&]	Comments
										electrons. Because the uncertainties on Ice′s are larger than that for Iγ, I(γ+ce) calculated from Iγ and α is given for 80.412-keV transition.
82.282 *6*	2.6 *2*	1478.37	(5)$^-$	1396.09	(5)$^-$	M1(+E2)	<0.06	16.33 *11*	45.0 *20*	α(L)=12.16 *8*; α(M)=3.008 *23*; α(N+..)=1.166 *9*
85.086 *7*	1.07 *9*	1396.09	(5)$^-$	1311.00	5$^-$	M1(+E2)	≤0.27	15.4 *16*	17.5 *10*	α(L)=11.5 *5*; α(M)=2.86 *14*; α(N+..)=1.11 *6* δ: E2 admixture of≤7% listed In 1977Fr03 was determined from L1/L3=10.0 *5*/0.5 *5*. α(L1)(exp)=10.0 *5*/1.07 *9* gives δ=0.21 *+25−21*. α(δ=0.14 *14*)=15.4 *+16−7*.
99.160 *10*	0.80 *7*	141.875	4$^+$	42.721	2$^+$	E2		23.8	21.0 *10*	α(L)=17.0; α(M)=4.84; α(N+..)=1.934
102.623 *10*	0.21 *3*	1008.51	5$^-$	905.89	3$^-$	E2		20.28	4.0 *4*	α(L)=14.50; α(M)=4.13; α(N+..)=1.650 Iγ=0.21 *3* is calculated from Ice(L3; measured)=1.09 *15*, α(L3)(E2 theory)=5.24 and Ice(M2; measured)=0.51 *4*, α(M2)(E2 theory)=2.400.
103.440 *10*	0.71 *6*	1499.53	(6)$^-$	1396.09	(5)$^-$	M1+E2	0.25 *+15−10*	9.1 *9*	7.2 *7*	α(L)=6.7 *6*; α(M)=1.68 *19*; α(N+..)=0.66 *5*
(119.4 *3*)	0.00006 *3*	1071.37	3$^+$	951.98	4$^-$	[E1]		0.0956		α(L)=0.0714; α(M)=0.0177; α(N+..)=0.00656 E_γ: γ was not observed In 8.6-H ^{250}Es ε decay. Energy is from ^{250}Bk β^- decay. I_γ: calculated from Iγ(119γ)/Iγ(1028γ)=0.0015 *5*/10.9 *3*, measured In ^{250}Bk β^- decay.
140.694 *10*	4.7 *3*	1396.09	(5)$^-$	1255.39	4$^-$	M1(+E2)	<0.1	15.6	77 *5*	α(K)=12.1; α(L)=2.58; α(M)=0.636; α(N+..)=0.247
146.8 *1*	0.22 *6*	1457.76	(6)$^-$	1311.00	5$^-$	M1(+E2)	<0.6	13.0 *18*	3.2 *3*	α(K)=9.9 *19*; α(L)=2.33 *10*; α(M)=0.58 *5*; α(N+..)=0.227 *19*
154.35 *6*	0.31 *7*	296.22	6$^+$	141.875	4$^+$	E2		3.33	1.3 *3*	α(K)=0.155; α(L)=2.27; α(M)=0.647; α(N+..)=0.258 $I_{(\gamma+ce)}$: calculated from Iγ and α. The authors of 1977Fr03 obtained ce intensities from the measured Ice(L2), and listed I(γ+ce)=2.1 *2*.
(165.44 *15*)	0.00012 *2*	1071.37	3$^+$	905.89	3$^-$	[E1]		0.1726		α(K)=0.1305; α(L)=0.0315; α(M)=0.00776; α(N+..)=0.00289 E_γ: γ was not observed In 8.6-H ^{250}Es ε decay. Energy is from ^{250}Bk β^- decay. I_γ: calculated from Iγ(165γ)/Iγ(1028γ)=0.0030 *4*/10.9 *3*, measured In ^{250}Bk β^- decay.
184.2 *2*	0.47 *7*	1255.39	4$^-$	1071.37	3$^+$	[E1]		0.1352	0.53 *7*	α(K)= 0.1029; α(L)=0.0242; α(M)=0.00595; α(N+..)=0.00221
(199.72 *20*)	0.00010 *2*	1071.37	3$^+$	871.57	2$^-$	[E1]		0.1127		α(K)=0.0861; α(L)=0.01986; α(M)=0.00488; α(N+..)=0.00182 E_γ: γ was not observed In 8.6-H ^{250}Es ε

^{250}Es ε decay (8.6 h) (continued)

γ(^{250}Cf) (continued)

$E_γ$[†]	$I_γ$[‡&]	E_i(level)	$J^π_i$	E_f	$J^π_f$	Mult.[#]	δ[#]	α[a]	$I_{(γ+ce)}$[@&]	Comments
										decay. Energy is from ^{250}Bk $β^-$ decay. $I_γ$: calculated from Iγ(199γ)/Iγ(1028γ)=0.0024 3/10.9 3, measured In ^{250}Bk $β^-$ decay.
222.993 20	1.85 13	1478.37	(5)$^-$	1255.39	4$^-$	M1+E2	0.42 7	3.71 15	8.6 3	α(K)=2.82 13; α(L)=0.663 10; α(M)=0.1661 18; α(N+..)=0.0639 6
246.92 6	3.8 2	1255.39	4$^-$	1008.51	5$^-$	M1+E2	1.00 6	1.86 9	10.7 4	α(K)=1.29 8; α(L)=0.416 7; α(M)=0.1078 14; α(N+..)=0.0418 5
[x]299.6 2	1.00 9									
303.41 3	22.3 11	1255.39	4$^-$	951.98	4$^-$	M1+E2	0.92 7	1.09 10	46.7 16	α(K)=0.79 5; α(L)=0.221 7; α(M)=0.0566 14; α(N+..)=0.0219 5
349.4 1	20.4 9	1255.39	4$^-$	905.89	3$^-$	E2+M1	4.6 5	0.223 12	25.0 10	α(K)=0.106 10; α(L)=0.0850 14; α(M)=0.0232 3; α(N+..)=0.00916 11
383.7 1	14.0 7	1255.39	4$^-$	871.57	2$^-$	E2		0.1346	16.0 8	α(K)=0.0564; α(L)=0.0566; α(M)=0.0155; α(N+..)=0.00615
712.3 1	1.34 9	1008.51	5$^-$	296.22	6$^+$	[E1]		0.00859	1.34 9	α(K)=0.00688; α(L)=0.00129
764.2 1	4.0 2	905.89	3$^-$	141.875	4$^+$	E1		0.00758	4.0 2	α(K)=0.00608; α(L)=0.00113
810.2 1	9.1 5	951.98	4$^-$	141.875	4$^+$	E1		0.00684	9.1 5	α(K)=0.00549; α(L)=0.00101
829.00 7	73.6 37	871.57	2$^-$	42.721	2$^+$	E1		0.00658	74 4	α(K)=0.00528; α(L)=0.00097
863.2 1	5.1 3	905.89	3$^-$	42.721	2$^+$	E1		0.00613	5.1 3	α(K)=0.00493; α(L)=0.00090
866.7 1	1.3 1	1008.51	5$^-$	141.875	4$^+$	[E1]		0.00608	1.3 1	α(K)=0.00489; α(L)=0.00090
929.4 2	0.14 2	1071.37	3$^+$	141.875	4$^+$	[E2]		0.0180		α(K)=0.01280; α(L)=0.00394
1028.5 2	0.45 4	1071.37	3$^+$	42.721	2$^+$	(E2)		0.0148 9		α(K)=0.01079; α(L)=0.00308 Mult.: determined In ^{250}Bk $β^-$ decay.

[†] Measurement of 1977Fr03.

[‡] Relative photon intensity, measured by 1977Fr03. The relative intensities were normalized such that sum of transition intensities feeding the ground-state band is 100%. Therefore, the Iγ′s listed here correspond to per 100 ε decays.

[#] Determined by 1977Fr03 from their ce data. Multipolarities In square brackets are deduced from level scheme, they are not determined experimentally.

[@] Sum of Ice+Iγ, measured by 1977Fr03, unless noted otherwise. The relative ce intensities were normalized to Iγ′s by using well resolved conversion lines from transitions with established multipolarities (determined from sub-shell ratios). Theoretical conversion coefficients were utilized when conversion-electron lines were not seen.

[&] For absolute intensity per 100 decays, multiply by 0.985 15.

[a] 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.

[x] γ ray not placed in level scheme.

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