^{133}Pr ε decay (6.5 min) 1990Ra22,1989Li22

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Yu. Khazov and A. Rodionov, F. G. Kondev	NDS 112, 855 (2011)	31-Oct-2010

Parent: ^{133}Pr: E=0.0; J^π=(3/2$^+$); $T_{1/2}$=6.5 min *3*; Q(ε)=4486 *21*; %ε+%β^+ decay=100.0

1990Ra22, 1989Li22: ^{133}Pr(ε) [from ^{nat}Ce(^{3}He,X), E=280 MeV]; measured γ, ce, γγ(t), (ce)γ(t), x-rays; deduced levels, J^π.
mass-separator source, tape transport system, HPGe, Si(Li) detectors, plastic scintillator; IBFM calculations.

Other: 1972ArZP.

^{133}Ce Levels

E(level)†	J^π‡	$T_{1/2}$	Comments
0.0	1/2$^+$	97 min *4*	$T_{1/2}$: from Adopted Levels.
134.20 *9*	3/2$^+$		
241.99 *9*	5/2$^+$		
315.69 *10*	3/2$^+$		
318.00 *9*	5/2$^+$		
465.18 *10*	1/2$^+$		E(level): fed directly in ^{133}Pr ε decay (6.5 min).
496.75 *11*	(1/2,3/2,5/2)$^+$		
570.70 *22*	7/2$^+$		
621.18 *10*	3/2$^-$		
656.64 *12*	1/2$^+$,3/2,5/2$^+$		
779.33 *10*	(3/2,5/2)$^+$		
787.62 *17*			
834.80 *15*	(1/2,3/2,5/2$^+$)		
902.68? *23*			
1005.56 *13*	(1/2$^+$,3/2,5/2$^+$)		
1116.18? *23*			
1335.18? *23*			
1521.00? *22*			
1573.35? *23*			
1881.30 *16*			

† From a least-squares fit to Eγ′s.
‡ From 'Adopted Levels'.

γ(^{133}Ce)

E_γ‡	I_γ‡	E_i(level)	J^π_i	E_f	J^π_f	Mult.#	α†	Comments
73.6 *2*	1.8 *2*	315.69	3/2$^+$	241.99	5/2$^+$	M1	2.86 *5*	α(L)exp=0.29 *12* α(K)=2.44 *4*; α(L)=0.334 *6*; α(M)=0.0700 *12*; α(N+..)=0.0182 *3* α(N)=0.01553 *25*; α(O)=0.00251 *4*; α(P)=0.000189 *3*
76.0 *2*	1.1 *1*	318.00	5/2$^+$	241.99	5/2$^+$			
107.7 *2*	0.4 *1*	241.99	5/2$^+$	134.20	3/2$^+$			
124.4 *2*	0.2 *1*	621.18	3/2$^-$	496.75	(1/2,3/2,5/2)$^+$			
134.3 *2*	100	134.20	3/2$^+$	0.0	1/2$^+$	M1	0.513	α(K)exp=0.45 *7*; α(L)exp=0.046 *12*; α(M)exp=0.013 *4* α(K)=0.438 *7*; α(L)=0.0596 *9*; α(M)=0.01248 *19*; α(N+..)=0.00325 *5* α(N)=0.00277 *4*; α(O)=0.000448 *7*; α(P)=3.39×10^{-5} *5*
147.2 *2*	2.0 *2*	465.18	1/2$^+$	318.00	5/2$^+$			
149.6 *2*	6.3 *6*	465.18	1/2$^+$	315.69	3/2$^+$			

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^{133}Pr ε decay (6.5 min) 1990Ra22,1989Li22 (continued)

γ(^{133}Ce) (continued)

Eγ‡	Iγ‡	Ei(level)	J^π_i	Ef	J^π_f	Mult.#	α†	Comments
158.4 *2*	0.6 *1*	779.33	(3/2,5/2)+	621.18	3/2−			
178.8 *2*	0.7 *1*	496.75	(1/2,3/2,5/2)+	318.00	5/2+			
181.3 *2*	3.7 *4*	315.69	3/2+	134.20	3/2+	M1	0.223	α(L)exp=0.026 *12* α(K)=0.191 *3*; α(L)=0.0258 *4*; α(M)=0.00539 *8*; α(N+..)=0.001405 *21* α(N)=0.001196 *18*; α(O)=0.000194 *3*; α(P)=1.470×10^{-5} *21*
183.8 *2*	9.5 *9*	318.00	5/2+	134.20	3/2+	M1	0.215	α(L)exp=0.028 *9* α(K)=0.184 *3*; α(L)=0.0248 *4*; α(M)=0.00519 *8*; α(N+..)=0.001353 *20* α(N)=0.001152 *17*; α(O)=0.000187 *3*; α(P)=1.415×10^{-5} *21*
223.2 *2*	5.4 *5*	465.18	1/2+	241.99	5/2+	E2	0.1273	α(K)exp=0.092 *23*; α(L)exp=0.023 *7* α(K)=0.0984 *14*; α(L)=0.0227 *4*; α(M)=0.00493 *8*; α(N+..)=0.001236 *18* α(N)=0.001070 *16*; α(O)=0.0001594 *23*; α(P)=6.17×10^{-6} *9*
241.9 *2*	42 *4*	241.99	5/2+	0.0	1/2+	E2	0.0975	K/LM=3.2 *10* α(K)=0.0763 *11*; α(L)=0.01669 *24*; α(M)=0.00362 *6*; α(N+..)=0.000908 *13* α(N)=0.000786 *12*; α(O)=0.0001177 *17*; α(P)=4.86×10^{-6} *7*
254.8 *2*	0.8 *1*	496.75	(1/2,3/2,5/2)+	241.99	5/2+			
281.5 *2*	<0.5	902.68?		621.18	3/2−			
290.6 *2*	<0.5	787.62		496.75	(1/2,3/2,5/2)+			
303.0 *2*	8.0 *8*	621.18	3/2−	318.00	5/2+	E1	0.01214	α(K)exp=0.015 *5* α(K)=0.01042 *15*; α(L)=0.001360 *20*; α(M)=0.000283 *4*; α(N+..)=7.30×10^{-5} *11* α(N)=6.24×10^{-5} *9*; α(O)=9.97×10^{-6} *14*; α(P)=7.07×10^{-7} *10*
314.2 *2*	4.5 *4*	779.33	(3/2,5/2)+	465.18	1/2+			
315.6 *2*	88 *9*	315.69	3/2+	0.0	1/2+	M1	0.0504	α(L)exp=0.0060 *15*; K/L=9.5 *19* α(K)=0.0432 *6*; α(L)=0.00575 *9*; α(M)=0.001200 *17*; α(N+..)=0.000313 *5* α(N)=0.000266 *4*; α(O)=4.32×10^{-5} *6*; α(P)=3.30×10^{-6} *5*
318.0 *2*	7.3 *7*	318.00	5/2+	0.0	1/2+			
330.9 *2*	51 *5*	465.18	1/2+	134.20	3/2+	M1	0.0446	α(K)exp=0.041 *6*; α(L)exp=0.0071 *21*; K/L=7.7 *19* α(K)=0.0382 *6*; α(L)=0.00507 *8*; α(M)=0.001059 *15*; α(N+..)=0.000276 *4* α(N)=0.000235 *4*; α(O)=3.82×10^{-5} *6*; α(P)=2.92×10^{-6} *5*
340.9 *2*	0.8 *1*	656.64	1/2+,3/2,5/2+	315.69	3/2+			
362.5 *2*	13.5 *14*	496.75	(1/2,3/2,5/2)+	134.20	3/2+	M1	0.0352	α(K)exp=0.045 *13*; α(L)exp=0.0051

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^{133}Pr ε decay (6.5 min) 1990Ra22,1989Li22 (continued)

γ(^{133}Ce) (continued)

E_γ‡	I_γ‡	E_i(level)	J_i^π	E_f	J_f^π	Mult.#	α†	Comments
								18 α(K)=0.0301 *5*; α(L)=0.00399 *6*; α(M)=0.000834 *12*; α(N+..)=0.000217 *3* α(N)=0.000185 *3*; α(O)=3.00×10^{-5} *5*; α(P)=2.30×10^{-6} *4*
379.3 *2*	2.3 *2*	621.18	3/2$^-$	241.99	5/2$^+$			
414.5 *2*	1.0 *1*	656.64	1/2$^+$,3/2,5/2$^+$	241.99	5/2$^+$			
436.5 *2*	2.3 *2*	570.70	7/2$^+$	134.20	3/2$^+$			
461.2 *2*	2.5 *2*	779.33	(3/2,5/2)$^+$	318.00	5/2$^+$			
463.4 *2*	1.0 *1*	779.33	(3/2,5/2)$^+$	315.69	3/2$^+$			
465.2 *2*	61 *6*	465.18	1/2$^+$	0.0	1/2$^+$	M1	0.0186	α(K)exp=0.016 *3* α(K)=0.01597 *23*; α(L)=0.00210 *3*; α(M)=0.000438 *7*; α(N+..)=0.0001141 *16* α(N)=9.71×10^{-5} *14*; α(O)=1.578×10^{-5} *23*; α(P)=1.215×10^{-6} *17*
487.1 *2*	2.1 *2*	621.18	3/2$^-$	134.20	3/2$^+$			
495.0 *2*	1.0 *1*	1116.18?		621.18	3/2$^-$			
496.4 *2*	7.3 *7*	496.75	(1/2,3/2,5/2)$^+$	0.0	1/2$^+$			
522.6 *2*	1.8 *2*	656.64	1/2$^+$,3/2,5/2$^+$	134.20	3/2$^+$			
537.3 *2*	6.0 *6*	779.33	(3/2,5/2)$^+$	241.99	5/2$^+$	M1	0.01298	α(K)exp=0.013 *5* α(K)=0.01114 *16*; α(L)=0.001457 *21*; α(M)=0.000304 *5*; α(N+..)=7.92×10^{-5} *12* α(N)=6.74×10^{-5} *10*; α(O)=1.096×10^{-5} *16*; α(P)=8.45×10^{-7} *12*
621.4 *2*	1.3 *1*	621.18	3/2$^-$	0.0	1/2$^+$			
645.2 *2*	11.7 *12*	779.33	(3/2,5/2)$^+$	134.20	3/2$^+$	(E2)	0.00555 *8*	α(K)exp=0.0043 *22* α=0.00555 *8*; α(K)=0.00468 *7*; α(L)=0.000684 *10*; α(M)=0.0001439 *21*; α(N+..)=3.71×10^{-5} *6* α(N)=3.17×10^{-5} *5*; α(O)=5.03×10^{-6} *7*; α(P)=3.35×10^{-7} *5*
653.7 *2*	0.7 *1*	787.62		134.20	3/2$^+$			
656.7 *2*	1.3 *1*	656.64	1/2$^+$,3/2,5/2$^+$	0.0	1/2$^+$			
687.8 *2*	<1.6	1005.56	(1/2$^+$,3/2,5/2$^+$)	318.00	5/2$^+$			
689.7 *2*	4.2 *4*	1005.56	(1/2$^+$,3/2,5/2$^+$)	315.69	3/2$^+$			
700.5 *2*	2.3 *2*	834.80	(1/2,3/2,5/2$^+$)	134.20	3/2$^+$			
714.0 *2*	1.1 *1*	1335.18?		621.18	3/2$^-$			
779.4 *2*	2.6 *3*	779.33	(3/2,5/2)$^+$	0.0	1/2$^+$			
834.9 *2*	2.4 *2*	834.80	(1/2,3/2,5/2$^+$)	0.0	1/2$^+$			
1005.5 *2*	1.4 *1*	1005.56	(1/2$^+$,3/2,5/2$^+$)	0.0	1/2$^+$			
1076.6 *2*	0.3 *1*	1573.35?		496.75	(1/2,3/2,5/2)$^+$			
1386.8 *2*	0.7 *1*	1521.00?		134.20	3/2$^+$			
1639.3 *2*	0.5 *1*	1881.30		241.99	5/2$^+$			
1747.1 *2*	0.4 *1*	1881.30		134.20	3/2$^+$			

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^{133}Pr ε decay (6.5 min) 1990Ra22,1989Li22 (continued)

$\gamma(^{133}Ce)$ (continued)

† Additional information 1.

‡ From 1990Ra22. The authors state that uncertainties for most intensities are less than 10%. The evaluators assigned $\Delta I\gamma$=10% to the weak γ's quoted to a single digit only.

From measured conversion-electron coefficients (1990Ra22). The α(K)exp values are normalized to 0.0763 *11* for the 241.9γ, E2 (calculated with BrIcc code (2008Ki07)).

^{133}Pr ε decay (6.5 min)   1990Ra22,1989Li22

Decay Scheme

Intensities: Relative I_γ