

$^{251}\text{Bk } \beta^-$ decay [1984Li05](#)

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	C. Morse	NDS 189,111 (2023)	23-Sep-2022

Parent: ^{251}Bk : $E=0$; $J^\pi=(3/2^-)$; $T_{1/2}=56$ min I ; $Q(\beta^-)=1093$ $I0$; $\% \beta^-$ decay=100

$^{251}\text{Bk}-Q(\beta^-)$: From [2021Wa16](#).

[1984Li05](#): Bk source from $^{248}\text{Cm}(^{18}\text{O},\text{X})$, chem; measured γ (Ge detector), β (pc, plastic scin).

Others: [1970HoZN](#), [1967Di02](#).

Level scheme is from [1984Li05](#) and agrees with the level scheme deduced from $^{255}\text{Fm } \alpha$ decay.

 ^{251}Cf Levels

E(level) [†]	J^π [‡]	Comments
0	$1/2^+$	configuration= $\nu 1/2^+$ [620] (1984Li05)
25	$3/2^+$	
48	$5/2^+$	
178	$3/2^+$	
212	$5/2^+$	configuration= $\nu 3/2^+$ [622] (1984Li05)

[†] From [1984Li05](#).

[‡] From Adopted Levels.

 β^- radiations

$I(\beta^-)/I\gamma(177.7) \approx 33$ ($I\beta^-$ measured with pc, the presence of ce intensity was ignored) ([1984Li05](#)).

Because the γ rays connecting the levels in the ground band were not observed, the β feeding to the ground state includes the feeding to the 25-keV and 48-keV levels as well.

E(decay)	E(level)	$I\beta^-$ [†]	Log ft	Comments
(881 $I0$)	212	≈ 5	≈ 7.1	av $E\beta=274.3$ 36 $I\beta^-$: from intensity balance in level scheme.
(915 $I0$)	178	90 5	5.93 3	av $E\beta=286.4$ 36 E(decay): 915 keV from F-K plot (1984Li05). $I\beta^-$: from 1984Li05 .
(1093 $I0$)	0	≈ 5	≈ 7.5	av $E\beta=350.6$ 37 E(decay): 1130 keV from F-K plot (1984Li05).

[†] Absolute intensity per 100 decays.

 $\gamma(^{251}\text{Cf})$

$I\gamma$ normalization: Deduced by evaluator, based on the measured $I\gamma$, level scheme, and the 90% $5 \beta^-$ branch to the 178 level reported in [1984Li05](#).

$K \times \text{ray}/I\gamma(177.7)=6.67$ 33 ([1984Li05](#)).

E_γ [†]	$E_i(\text{level})$	J^π_i	E_f	J^π_f	Mult. [‡]	$\alpha^\#$	Comments
(23)	48	$5/2^+$	25	$3/2^+$	(M1+E2)	8×10^3 8	$\alpha(L)=4 \times 10^3$ 4 ; $\alpha(M)=2.7 \times 10^3$ 26 ; $\alpha(N)=8 \times 10^2$ 7 ; $\alpha(O)=1.9 \times 10^2$ 18 ; $\alpha(P)=30$ 28 ; $\alpha(Q)=0.0946$ 33
(25)	25	$3/2^+$	0	$1/2^+$	M1+E2	5×10^3 5	$\alpha(L)=2.9 \times 10^3$ 29 ; $\alpha(M)=1.8 \times 10^3$ 17 ; $\alpha(N)=5 \times 10^2$ 5 ; $\alpha(O)=1.3 \times 10^2$ 12 ; $\alpha(P)=20$ 19 ; $\alpha(Q)=0.070$ 6

Continued on next page (footnotes at end of table)

$^{251}\text{Bk} \beta^-$ decay [1984Li05](#) (continued) $\gamma(^{251}\text{Cf})$ (continued)

E_γ [†]	I_γ ^{†@}	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult. [‡]	δ	α [#]	Comments
									$\alpha(\text{L})=2.9 \times 10^3$ 29; $\alpha(\text{M})=1.8 \times 10^3$ 17; $\alpha(\text{N})=5 \times 10^2$ 5; $\alpha(\text{O})=1.3 \times 10^2$ 12; $\alpha(\text{P})=20$ 19; $\alpha(\text{Q})=0.070$ 6
(48)		48	$5/2^+$	0	$1/2^+$	E2		725 10	$\alpha(\text{L})=522$ 7; $\alpha(\text{M})=148.8$ 21; $\alpha(\text{N})=41.8$ 6; $\alpha(\text{O})=10.33$ 14; $\alpha(\text{P})=1.621$ 23; $\alpha(\text{Q})=0.00381$ 5
130	58 12	178	$3/2^+$	48	$5/2^+$	M1		4.00 6	$\alpha(\text{L})=2.99$ 4; $\alpha(\text{M})=0.736$ 10; $\alpha(\text{N})=0.2039$ 29; $\alpha(\text{O})=0.0529$ 7; $\alpha(\text{P})=0.01023$ 14 $\alpha(\text{Q})=0.000602$ 8 E_γ : from E(level), γ is masked by $\text{K}\beta_1$ x ray ($\text{E}(\text{K}\beta_1 \text{ x ray})=130.85$). I_γ : deduced by 1984Li05 from an excess of $\text{K}\beta_1$ x ray ($\text{K}\beta_1 \text{ x ray}/\text{K}\alpha_1 \text{ x ray}=0.53$ 4 (measured)=0.343 (theory)) and $\text{K}\alpha_1$ x ray/ $I_\gamma(178\gamma)=3.19$ 14.
153	38.5 25	178	$3/2^+$	25	$3/2^+$	M1		11.32 16	$\alpha(\text{K})=8.81$ 12; $\alpha(\text{L})=1.876$ 26; $\alpha(\text{M})=0.461$ 6; $\alpha(\text{N})=0.1278$ 18; $\alpha(\text{O})=0.0332$ 5 $\alpha(\text{P})=0.00641$ 9; $\alpha(\text{Q})=0.000377$ 5
164	6.0 12	212	$5/2^+$	48	$5/2^+$	[M1]		9.30 13	$\alpha(\text{K})=7.24$ 10; $\alpha(\text{L})=1.539$ 22; $\alpha(\text{M})=0.378$ 5; $\alpha(\text{N})=0.1048$ 15; $\alpha(\text{O})=0.0272$ 4 $\alpha(\text{P})=0.00525$ 7; $\alpha(\text{Q})=0.000309$ 4
178	100	178	$3/2^+$	0	$1/2^+$	M1+E2	0.44 8	6.47 30	$\alpha(\text{K})=4.84$ 29; $\alpha(\text{L})=1.214$ 17; $\alpha(\text{M})=0.306$ 5; $\alpha(\text{N})=0.0849$ 13; $\alpha(\text{O})=0.02187$ 32 $\alpha(\text{P})=0.00411$ 6; $\alpha(\text{Q})=0.000209$ 11 δ : From ^{251}Es ε decay.
(186.8)	3.0 6	212	$5/2^+$	25	$3/2^+$	[M1]		6.44 9	$\alpha(\text{K})=5.02$ 7; $\alpha(\text{L})=1.062$ 15; $\alpha(\text{M})=0.261$ 4; $\alpha(\text{N})=0.0723$ 10; $\alpha(\text{O})=0.01877$ 26 $\alpha(\text{P})=0.00363$ 5; $\alpha(\text{Q})=0.0002129$ 30 E_γ, I_γ : from adopted gammas.

[†] From [1984Li05](#).[‡] From adopted gammas.[#] [Additional information 1](#).[@] For absolute intensity per 100 decays, multiply by 0.060 4.

²⁵¹Bk β⁻ decay 1984Li05

Decay Scheme

Intensities: I_(γ+ce) per 100 parent decays

Legend

- I_γ < 2% × I_γ^{max}
- I_γ < 10% × I_γ^{max}
- I_γ > 10% × I_γ^{max}
- - - - - γ Decay (Uncertain)

