^{235}Th β^- decay 1986Mi10

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. Browne, J. K. Tuli	NDS 122, 205 (2014)	1-Feb-2014

Parent: ^{235}Th: E=0; $J^\pi=(1/2^+)$; $T_{1/2}$=7.1 min *2*; Q(β^-)=1729 *19*; %β^- decay=100.0

Additional information 1.

1986Mi10: Source prepared by irradiating natural U with 30-160 MeV, 14-MeV n; chem, measured γ, β, γ(t); Ge(Li), α(P).

Analogy with ^{233}Th and ^{237}U β^- decays suggests that the main β^- branches feed the (3/2$^-$) g.s. and (1/2$^-$) first excited state in ^{235}Pa. This suggestion has been confirmed by the low experimental absolute γ-ray intensities (Iγ normalization≈0.02 from 1986Mi10 and 1989Yu01). However, the experimental β^- endpoint of 1440 *50* (1989Yu01) together with Q(β^-)=1729 *19* (2012Wa38) (mass adjustment) suggests that there is a significant β^- feeding to a level at about 290 keV. This discrepancy has not been resolved.

^{235}Pa Levels

E(level)	J^π
0	(3/2$^-$)
(10.0 *10*)	(1/2$^-$)
18.52 *16*	(1/2$^+$)
51.79 *16*	(3/2$^+$)
344.69 *19*	(3/2$^+$)
468.79 *15*	(1/2,3/2)
727.01 *17*	(1/2,3/2)
747.90 *15*	(1/2,3/2)
755.75 *24*	(1/2,3/2)

β^- radiations

E(decay)	E(level)	Iβ^-[†][‡]	Log *ft*	Comments
(973 *19*)	755.75	≈0.7	≈7.1	av Eβ=312 *7*
(981 *19*)	747.90	≈1.5	≈6.7	av Eβ=315 *7*
(1002 *19*)	727.01	≈1.4	≈6.8	av Eβ=323 *7*
(1260 *19*)	468.79	≈2.8	≈6.9	av Eβ=420 *8*
(1384 *19*)	344.69	≈0.3	≈8.0	av Eβ=468 *8*
(1677[#] *19*)	51.79			
(1710[#] *19*)	18.52			
(1719[#] *19*)	(10.0)			
(1729[#] *19*)	0	≈93	≈6	av Eβ=604 *8* E(decay): Eβ=1440 *50* from 1989Yu01 (abstract and fig. 3; the value 1400 in the text is probably incorrect. The value Q(β^-)=1470 keV 80, also given in 1989Yu01, assumes that the main β^- branch feeds the 1/2[400] rotational band, which is unexpected from systematics). This value of Eβ is inconsistent with Q(β^-)=1729 keV *19* (2012Wa38). Iβ^-: from γ-ray transition intensity balance. Iβ≈93% includes possible feedings to the <10 keV (1/2$^-$), 18.6 keV (1/2$^+$), and 51.7 keV (3/2$^+$) levels.

[†] Intensities are approximate. They have been deduced from γ-ray photon intensity balances without including conversion electrons.

[‡] Absolute intensity per 100 decays.

[#] Existence of this branch is questionable.

^{235}Th β^- decay 1986Mi10 (continued)

$\gamma(^{235}Pa)$

Iγ normalization: from Iγ(417γ)/β^-=2% *1* (1989Yu01). This value agrees with Iγ(417γ)/β^-≈2%, which was obtained by 1986Mi10 on the basis of the estimated cross sections for the production of ^{235}Th.

E_γ [†]	I_γ [†‡]	E_i(level)	J_i^π	E_f	J_f^π	$I_{(\gamma+ce)}$ [‡]	Comments
(≤10)		(10.0)	(1/2$^-$)	0	(3/2$^-$)	≈50	E_γ: based on E(level)<10 keV. $I_{(\gamma+ce)}$: based on analogy with ^{233}Th and ^{237}U β^- decays.
(18.6)		18.52	(1/2$^+$)	0	(3/2$^-$)		
(33.1)		51.79	(3/2$^+$)	18.52	(1/2$^+$)		
[x]174.8 *2*	7.6 *11*						
292.9 *1*	14.8 *2*	344.69	(3/2$^+$)	51.79	(3/2$^+$)		
[x]406.1 *1*	14.9 *14*						
417.0 *1*	100	468.79	(1/2,3/2)	51.79	(3/2$^+$)		
450.4 *2*	15 *4*	468.79	(1/2,3/2)	18.52	(1/2$^+$)		
468.7 *2*	24.8 *16*	468.79	(1/2,3/2)	0	(3/2$^-$)		
[x]484.2 *2*	19 *4*						
[x]644.9 *2*	28 *3*						
696.1 *2*	32.1 *18*	747.90	(1/2,3/2)	51.79	(3/2$^+$)		
704.0 *2*	27.1 *17*	755.75	(1/2,3/2)	51.79	(3/2$^+$)		
708.3 *2*	25.8 *17*	727.01	(1/2,3/2)	18.52	(1/2$^+$)		
727.2 *2*	43.3 *20*	727.01	(1/2,3/2)	0	(3/2$^-$)		
729.5 *2*	22.8 *17*	747.90	(1/2,3/2)	18.52	(1/2$^+$)		
737.0 *5*	10 *3*	755.75	(1/2,3/2)	18.52	(1/2$^+$)		
747.8 *2*	21.5 *16*	747.90	(1/2,3/2)	0	(3/2$^-$)		
[x]837.8 *2*	13.7 *14*						
[x]932.8 *2*	21.0 *16*						

[†] From 1986Mi10 Ge(Li). Other: 1970Tr09.
[‡] For absolute intensity per 100 decays, multiply by 0.02 *1*.
[x] γ ray not placed in level scheme.

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Decay Scheme

Intensities: I_γ per 100 parent decays