

²²⁷Ac β⁻ decay (21.772 y) 1959No41,1995Li04,1997Mu08

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Ictp-2014 Workshop Group		NDS 132, 257 (2016)	15-Jan-2016

Parent: ²²⁷Ac: E=0.0; J^π=3/2⁻; T_{1/2}=21.772 y 3; Q(β⁻)=44.8 8; %β⁻ decay=98.6200 36

1955Be20: measured β⁻ spectrum using 4π proportional counter.

1959No41: measured β⁻ spectrum, Ece, Ice using scintillation counter with a thin CsI(Tl) crystal for β⁻s and a magnetic spectrograph and scintillation counter with stilbene crystal for conversion electrons.

1995Li04: measured E_γ, I_γ using intrinsic Ge detector with Be window and Ece, Ice, β⁻ spectrum, β_γ coincidences using Si(Li) detector placed inside a magnetic lens.

1997Mu08: ²²⁷Ac activity from decay of ²²⁷Fr and ²²⁷Ra produced at the ISOLDE facility in CERN. Measured Ece, Ice ce-α coincidences using an iron-free magnetic spectrometer and silicon detector; deduced mult and δ for 24.5-keV transition.

²²⁷Th Levels

E(level)	J ^π †	T _{1/2} †
0.0‡	(1/2 ⁺)	18.68 d 9
9.3‡	(5/2 ⁺)	
24.5	(3/2 ⁺)	
37.9	(3/2 ⁻)	

† From the Adopted Levels.

‡ Band(A): K^π=1/2⁺ parity doublet rotational band.

β⁻ radiations

E(decay)	E(level)	Iβ ⁻ ‡#	Log ft	Comments
(6.9 8)	37.9	0.3	6.9	av Eβ=1.73 20 Iβ ⁻ : from β _γ coincidence (1995Li04).
(20.3 † 8)	24.5	≈10	≈6.8	av Eβ=5.11 21
(35.5 † 8)	9.3	≈35	≈7.0	av Eβ=8.98 21
(44.8 † 8)	0.0	≈54	≈7.1	av Eβ=11.37 21

† Eβ=45.5 keV 10 includes the β⁻ groups that populate the g.s., 9.3-, and 24.5-keV levels (1955Be20).

‡ Deduced from ce data of 1959No41, except where noted.

Absolute intensity per 100 decays.

γ(²²⁷Th)

E _γ †	I _γ ^c	E _i (level)	J _i ^π	E _f	J _f ^π	Mult.‡	α ^b	Comments
9.3 1	0.00011 ^a	9.3	(5/2 ⁺)	0.0	(1/2 ⁺)	(E2)	3.26×10 ⁵ 19	α(M)=2.44×10 ⁵ 14; α(N)=6.5×10 ⁴ 4; α(O)=1.44×10 ⁴ 9; α(P)=2.37×10 ³ 14; α(Q)=2.85 15 Mult.: from ce(M2):ce(M3):ce(N):ce(O)exp= 1425:1545:720:200 (1959No41); ce ratios are consistent with E2 multipolarity, however, an M1 admixture cannot be ruled out.
15.2 1	0.00063 ^{&}	24.5	(3/2 ⁺)	9.3	(5/2 ⁺)	(M1)	238 6	α(M)=177 5; α(N)=47.2 12; α(O)=11.2 3; α(P)=2.17 6; α(Q)=0.208 5

Continued on next page (footnotes at end of table)

^{227}Ac β^- decay (21.772 y) [1959No41](#),[1995Li04](#),[1997Mu08](#) (continued) $\gamma(^{227}\text{Th})$ (continued)

E_γ [†]	I_γ ^c	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult. [‡]	δ	α ^b	Comments
24.5 2	0.028&	24.5	(3/2 ⁺)	0.0	(1/2 ⁺)	M1+E2	0.097 5	326 15	Mult.: from ce(M1):ce(M3):ce(N1):exp=400:40:130 (1959No41). $\alpha(\text{L})=244$ 11; $\alpha(\text{M})=61$ 3; $\alpha(\text{N})=16.4$ 8; $\alpha(\text{O})=3.80$ 17; $\alpha(\text{P})=0.70$ 3; $\alpha(\text{Q})=0.0501$ 15 δ : from ce(M2)/ce(M1)exp=0.39 4, ce(M3)/ce(M1)exp=0.24 3 (1997Mu08). Mult.: from ce(M1)+ce(M2):ce(M3): ce(N)exp=50:8:15 (1959No41).
28.6 [#] 5	0.042@	37.9	(3/2 ⁻)	9.3	(5/2 ⁺)	E1 [#]		3.23 16	$\alpha(\text{L})=2.41$ 12; $\alpha(\text{M})=0.61$ 3; $\alpha(\text{N})=0.159$ 8; $\alpha(\text{O})=0.0340$ 17; $\alpha(\text{P})=0.00516$ 24 $\alpha(\text{Q})=0.000181$ 7
37.9 [#] 5	0.049@	37.9	(3/2 ⁻)	0.0	(1/2 ⁺)	E1 [#]		1.54 6	$\alpha(\text{L})=1.15$ 5; $\alpha(\text{M})=0.288$ 12; $\alpha(\text{N})=0.075$ 3; $\alpha(\text{O})=0.0163$ 7; $\alpha(\text{P})=0.00260$ 10 $\alpha(\text{Q})=0.000104$ 4

[†] From [1959No41](#), except where noted.

[‡] From ce ratios in [1959No41](#), except where noted.

[#] From [1995Li04](#).

@ From $I(\gamma+\text{ce})(28.6\gamma) + I(\gamma+\text{ce})(37.9\gamma)=0.3\%$, and $I_\gamma(37.9\gamma)/I_\gamma(28.6\gamma)=1.17$ 22 in ^{227}Pa ε decay.

& From $I(\gamma+\text{ce})(24.5\gamma) + I(\gamma+\text{ce})(15.2\gamma)=10\%$, and $I_\gamma(24.5\gamma)/I_\gamma(15.2\gamma)=45.5$ in ^{231}U α decay.

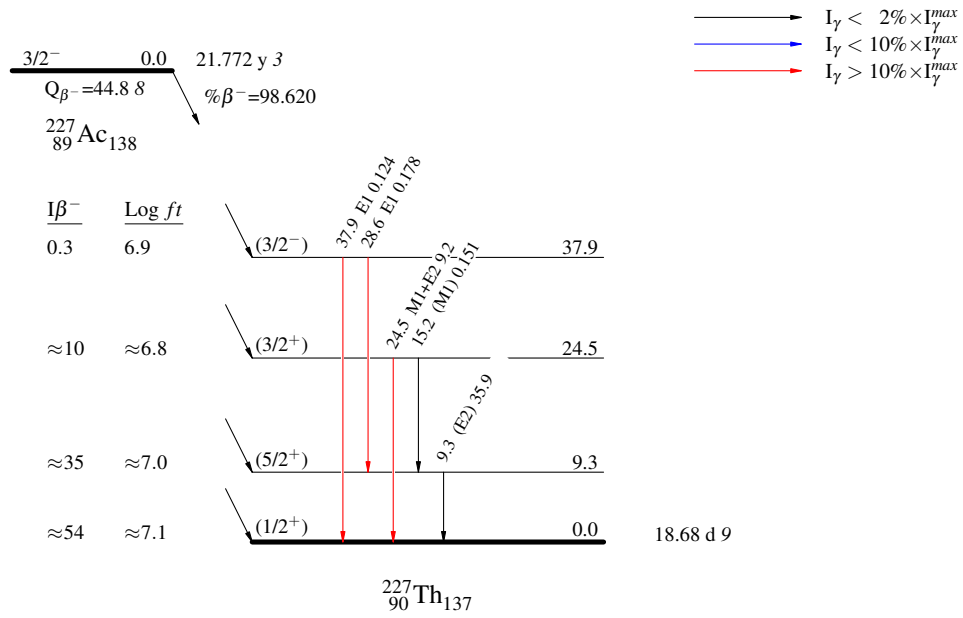
^a From $I(\gamma+\text{ce})(9.3\gamma)=35\%$ and $\alpha=326000$.

^b From BrIcc v2.3 (29-Mar-2013) [2008Ki07](#), "Frozen Orbitals" appr.

^c Absolute intensity per 100 decays.

^{227}Ac β^- decay (21.772 y) 1959No41,1995Li04,1997Mu08Decay SchemeIntensities: $I_{(\gamma+ce)}$ per 100 parent decays

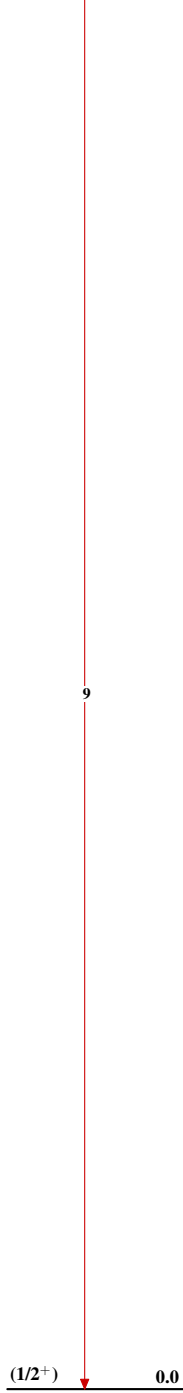
Legend



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Band(A): $K^\pi=1/2^+$
parity doublet
rotational band

(5/2⁺) 9.3



(1/2⁺) 0.0

$^{227}_{90}\text{Th}_{137}$