

^{222}Th α decay (1.964 ms) 2001Ku07,2016Pa28

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh, M. S. Basunia, Murray Martin et al. ,		NDS 160, 405 (2019)	30-Oct-2019

Parent: ^{222}Th : $E=0.0$; $J^\pi=0^+$; $T_{1/2}=1.964$ ms 2; $Q(\alpha)=8127$ 5; $\% \alpha$ decay=100.0

^{222}Th - $T_{1/2}$: From 2016Pa28. Others (in ms): 2.4 3 (2005Li17), 2.237 13 (2001Ku07), 2.0 1 (2000He17), 4.2 5 (1999Ho28), 2.2 2 (1991AnZZ), 2.8 3 (1970Va13), 4 1 (1970To07). Precise value from 2001Ku07 (a conference report), and value from 1999Ho28 are in severe disagreement with that from 2016Pa28, the former differing by ≈ 20 standard deviations. Note that the three measurements are from JYFL facility at the University of Jyväskylä with several of the same authors. For this reason, values from 2001Ku07 and 1999Ho28 are not considered here. Other values are in agreement, but are too imprecise to be considered for averaging.

^{222}Th - $Q(\alpha)$: From 2017Wa10.

^{222}Th - $\% \alpha$ decay: $\% \alpha=100$. $\% \epsilon < 1.3 \times 10^{-8}$, estimated by evaluators from a possible ϵ branch to ^{222}Ac g.s., with $\log ft > 5.9$.

Theoretical partial $T_{1/2} > 100$ s for ^{222}Th ϵ decay (2019Mo01) gives $\% \epsilon < 0.002$, and theoretical partial $T_{1/2} \approx 8 \times 10^{+4}$ s of 1973Ta30 gives $\% \epsilon \approx 3 \times 10^{-6}$.

Additional information 1.

 ^{218}Ra Levels

E(level)	J^π^\dagger	$T_{1/2}^\dagger$	Comments
0.0	0^+	25.2 μs 3	
389.5 5	2^+		E(level): from E_γ .
790 6	(3^-)		E(level): from E_α and $Q(\alpha)$ values.
853 6	(1^-)		E(level): from E_α and $Q(\alpha)$ values. E(level): on the basis of the γ to g.s. and the similarity in the α hindrance factors for the 793 and 853 levels, 2016Pa28 propose that the 853 level is a member of the octupole band. The energy inversion of the 1^- and 3^- members of this band supports an octupole-vibration description of the band, 1992Wi14 looked for but did not find any evidence for levels between the 3^- at 793 and the 2^+ at 389.

† From the Adopted Levels.

 α radiations

E_α	E(level)	$I\alpha^\ddagger$	HF †	Comments
7143 4	853	0.014 4	12 4	$E_\alpha, I\alpha$: from 2016Pa28.
7205 4	790	0.018 3	15 3	$E_\alpha, I\alpha$: from 2016Pa28.
7600 2	389.5	1.81 1	3.38 6	E_α : from the weighted average of 7603 3 (2016Pa28), 7599 2 (2001Ku07), 7600 15 (1991An13). $I\alpha$: from 2016Pa28. Others 2.3 2 (2001Ku07), 3 1 (1991An13).
7982 2	0.0	98.16 5	1.00	E_α : from the weighted average of 7986 3 (2016Pa28), 7980 2 (2001Ku07), 7970 48 (2005Li17), 7974 10 (2000He17), 7980 15 (1991An13), 7984 8 (1970To07), 7980 10 (1970Va13). $I\alpha$: From 2016Pa28, other: 97.7 9 (2001Ku07), 97 1 (1991An13).

† HF(7982 α)=1.0 yields $r_0(^{218}\text{Ra})=1.5571$ 17.

‡ Absolute intensity per 100 decays.

^{222}Th α decay (1.964 ms) 2001Ku07,2016Pa28 (continued) $\gamma(^{218}\text{Ra})$

E_γ	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Comments
389.5 5	389.5	2^+	0.0	0^+	E_γ : from 2001Ku07.
404	790	(3^-)	389.5	2^+	E_γ : from in beam studies (1992Wi14, 1983Ga11).
853	853	(1^-)	0.0	0^+	E_γ : from 2016Pa28.

 ^{222}Th α decay (1.964 ms) 2001Ku07,2016Pa28Decay Scheme