Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	B. Singh, R. Shearman	NDS 147, 382 (2018)	1-Dec-2017

Q(β^-)=−4863 19; S(n)=6164 16; S(p)=3228 15; Q(α)=9435 4 2017Wa10
S(2n)=14858 14, S(2p)=4906 13, Q(εp)=1626 14 (2017Wa10).

^{217}Th evaluated by B. Singh and R. Shearman.

1968Va18: ^{217}Th produced and identified in ^{206}Pb(^{16}O,5n),E=166 MeV at Berkeley HILAC facility, He-jet system, measured
    half-life of ^{217}Th decay. Later studies for production and decay of ^{217}Th isotope: ^{204}Pb(^{16}O,3n),E=91 MeV at Chalk-River
    (1973Ha32); ^{198}Pt(^{28}Si,α5n),E=140-180 MeV at JAERI-tandem accelerator (2000Ni02); ^{170}Er(^{51}V,p3n),E=214-286 MeV and
    ^{170}Er(^{50}Ti,3n),E=215-235 MeV at GSI (2000He17); ^{181}Ta(^{40}Ar,p3n),E=182 MeV at GSI (2002He29); ^{170}Er(^{50}Ti,3n),E=4.35
    MeV/nucleon at GSI (2005Ku31); ^{176}Yb(^{50}Ti,α5n),E(^{50}Ti)=231-255 MeV at GSI (2015Kh09).
2007Ma57 claimed to have found evidence for very long-lived isomers in ^{211,213,217,218}Th in naturally-occurring Th sample
    using inductively coupled plasma-sector field mass spectrometry, and suggested that such isomers could be associated with a new
    class of long-lived high-spin superdeformed or hyperdeformed structures. However, 2008La14, using accelerator mass spectrometry
    (AMS), with two orders of magnitude higher sensitivity than in 2007Ma57, could not confirm the existence of such long-lived
    activities.
Additional information 1.

^{217}Th Levels

Cross Reference (XREF) Flags

A	^{217}Th IT decay (141 ns)
B	^{217}Th IT decay (67 μs)
C	^{221}U α decay (0.66 μs)

E(level)[†]	J$^{\pi}$[‡]	T$_{1/2}$	XREF	Comments
0.0	(9/2$^+$)	0.252 ms 4	ABC	%α=100
				Only the α decay has been observed. Comparison of theoretical T$_{1/2}$>100 s for β decay (1997Mo25) and T$_{1/2}$=0.252 ms gives %ε<0.0003%.
				J$^{\pi}$: analogy to g.s. J$^{\pi}$ in N=127 isotones, ^{215}Ra and ^{213}Rn.
				T$_{1/2}$: from (evaporation residues (ER))α correlated or from α decays. The value is unweighted average of 0.259 ms 12 (2015Kh09, from ER-9269α decay); 0.257 ms 2 (2005Ku31, ER-9269α decay); 0.237 ms 2 (2002He29, average of 0.237 ms 1, 0.229 ms 6, 0.245 ms 6 from 9261α, 8725α and 8455α, respectively); 0.248 ms 3 (2000He17, average of 0.247 ms 3, 0.293 ms 28, 0.250 ms 8 from 9268α, 8731α and 8459α, respectively); 0.261 ms $+22-18$ (2000Ni02, average of 0.261 ms $+22-18$, 0.29 ms $+24-9$, 0.21 ms $+10-5$ from 9247α, 8713α and 8429α, respectively); 0.252 ms 7 (1973Ha32, from decay of 9250α). Weighted average is 0.248 ms 4 but with reduced χ^2 of 10.4. If the seemingly discrepant value of 0.237 ms 2 from 2002He29 is omitted from the averaging procedure, weighted average is 0.254 ms 2 with acceptable reduced χ^2=1.7, as compared to critical χ^2=2.4 at 95% confidence level. Others: 0.230 ms 106 (2009QiZZ), 0.310 ms 70 (2005Li17, from 9250α); <0.3 ms (1968Va18, from 9250α).
				The main α transition observed at Eα=9269 9 (2005Ku31), 9261 5 (2002He29), 9268 10 (2000He17), 9247 15 (2000Ni02), 9250 20 (1973Ha32), 9250 10 (1968Va18). Non-observation of (9269α)γ-coin (2005Ku31) is consistent with 9269α being a ground-state to ground-state transition.
673.3 1	(15/2$^-$)	141 ns 50	AB	%IT=100
				J$^{\pi}$: (E3) γ to (9/2$^+$); analogy to isomeric states in ^{213}Rn and ^{215}Ra.
				T$_{1/2}$: from γ(t) and ce(t) (1989Dr02).

Adopted Levels, Gammas (continued)

^{217}Th Levels (continued)

E(level)†	J$^{\pi}$‡	T$_{1/2}$	XREF	Comments
1942.61 *15*	(17/2$^+$)		B	
2251.91 *18*	(21/2$^+$)		B	
2251.91+x	(25/2$^+$)	67 μs +*17−11*	B	%IT=100
				E(level): x<110 keV, see comment in the γ-table.
				T$_{1/2}$: from (evaporation residues)$\gamma\alpha$ correlations for three γ rays (2005Ku31, average of 64 μs +*64−22*, 69 μs +*32−17* and 66 μs +*27−15* for 309γ, 673γ and 1269γ, respectively).

† Deduced by evaluators from Eγ data.
‡ From similarity to level structures and isomers in N=127 isotones ^{215}Ra, ^{213}Rn, ^{211}Po and ^{209}Pb (1989Dr02).

γ(^{217}Th)

E$_i$(level)	J$^{\pi}_i$	E$_{\gamma}$†	I$_{\gamma}$	E$_f$	J$^{\pi}_f$	Mult.	α‡	Comments
673.3	(15/2$^-$)	673.3 *1*	100	0.0	(9/2$^+$)	(E3)	0.0654	B(E3)(W.u.)=46 +*25−12* α(K)=0.0367 *6*; α(L)=0.0211 *3*; α(M)=0.00561 *8* α(N)=0.001507 *22*; α(O)=0.000346 *5*; α(P)=6.18×10^{-5} *9*; α(Q)=2.67×10^{-6} *4* Mult.: from ce measurements in 1989Dr02 (see ^{217}Th IT decay (141 ns) dataset); also systematics of N=127 isotones.
1942.61	(17/2$^+$)	1269.3 *1*	100	673.3	(15/2$^-$)	[E1]	0.01784	α(K)=0.01437 *21*; α(L)=0.00261 *4*; α(M)=0.000624 *9* α(N)=0.0001663 *24*; α(O)=3.94×10^{-5} *6*; α(P)=7.66×10^{-6} *11*; α(Q)=7.34×10^{-7} *11* α(IPF)=2.34×10^{-5} *4*
2251.91	(21/2$^+$)	309.3 *1*	100	1942.61	(17/2$^+$)	[E2]	0.1538	α(K)=0.0686 *10*; α(L)=0.0627 *9*; α(M)=0.01679 *24* α(N)=0.00450 *7*; α(O)=0.001016 *15*; α(P)=0.0001754 *25*; α(Q)=4.24×10^{-6} *6*
2251.91+x	(25/2$^+$)	x		2251.91	(21/2$^+$)			E$_\gamma$: x<110 keV, from small number of thorium K x-rays observed in $\gamma\gamma$-coincidences gated by the 309, 673 or 1269 keV γ-rays 2005Ku31 concluded that the transition energy is probably below the K-electron binding energy of ≈110 keV. Mult.: E2 expected from systematics of N=127 isotones.

† From ^{217}Th IT decay (67 μs).
‡ Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level

(25/2⁺) →	2251.91+x 67 μs +*17−11*
(21/2⁺)	2251.91
(17/2⁺)	1942.61
(15/2⁻)	673.3 141 ns *50*
(9/2⁺)	0.0 0.252 ms *4*

309.3 [E2] 100
1269.3 [E1] 100
673.3 (E3) 100

$^{217}_{90}\text{Th}_{127}$