Adopted Levels, Gammas

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	ENSDF	10-Jun-2021

Q(β^-)=−6283 *21*; S(n)=7910 *15*; S(p)=3625 *15*; Q(α)=9849 *9* 2021Wa16
Q(ε)=1520 *60*, S(2n)=14074 *15*, S(2p)=5503 *13* (2021Wa16).
Additional information 1.
^{218}Th identified by 1973Hi06 in ^{209}Bi(^{14}N,5n) reaction and by 1973Ha32 in ^{206}Pb(^{16}O,4n), the two independent studies, 1973Hi06 published July 23, 1973, and 1973Ha32 on July 30, 1973.
Search for long-lived isomers: 2008La14 (no evidence found), 2007Ma57 (claimed evidence of presence of isomers).
Theory references: consult NSR database (www.nndc.bnl.gov/nsr/) for 64 primary references for calculations of half-lives of radioactive decays, and 23 for nuclear structure.

^{218}Th Levels

Cross Reference (XREF) Flags

- A ^{222}U α decay (4.7 μs)
- B ^{174}Yb(^{48}Ca,4nγ)
- C ^{206}Pb(^{16}O,4nγ),^{209}Bi(^{14}N,5nγ)

E(level)†	J$^\pi$‡	$T_{1/2}$	XREF	Comments
0.0#	0^+	122 ns *5*	ABC	%α=100 Only the α decay has been observed. Theoretical partial $T_{1/2}$>100 s for ^{218}Th $\varepsilon+\beta^+$ decay (2019Mo01) gives %ε+%β^+<1.2×10^{-7}. $T_{1/2}$: from decay curve for g.s. to g.s. 9666α. Weighted average (NRM) of 122 ns *8* (1973Ha32); 96 ns *7* (1973No09,1973Hi06); 125 ns *5* (1982Ch29); 0.16 μs *4* (2015Kh09); and 169 ns *+73−40* (2018Br13). Regular weighted average is 117 ns *7*, with reduced χ^2 of 3.7 as compared to critical χ^2=2.4. Weighted average is 125 ns *5* if the lowest value of 96 ns from 1973Hi06 is omitted. Configuration=$\pi(h^6_{9/2}f^2_{7/2})\otimes\nu g^2_{9/2}$ with 14% probability (2020Od01).
689.0# *3*	2^+		BC	J$^\pi$: E2 γ to 0^+. Configuration=$\pi(h^6_{9/2}f^2_{7/2})\otimes\nu g^2_{9/2}$ with 25% probability (2020Od01).
1078.0 *6*	(3^-)		BC	XREF: C(?). J$^\pi$: ΔJ=(1) γ to 2^+. Configuration=$\pi h^8_{9/2}\otimes\nu(g^1_{9/2}j^1_{15/2})$ with 26% probability (2020Od01).
1192.3# *5*	4^+		BC	J$^\pi$: E2 γ to 2^+. Configuration=$\pi(h^6_{9/2}f^2_{7/2})\otimes\nu g^2_{9/2}$ with 28% probability (2020Od01).
1560.8# *6*	6^+		BC	J$^\pi$: E2 γ to 4^+, yrast band member. Configuration=$\pi(h^6_{9/2}f^2_{7/2})\otimes\nu g^2_{9/2}$ with 28% probability (2020Od01).
1761.7# *7*	8^+	1.2 ns *2*	BC	$T_{1/2}$: from ce(t) in ^{209}Bi(^{14}N,5nγ). J$^\pi$: E2 γ to 6^+, yrast band member. Configuration=$\pi(h^6_{9/2}f^2_{7/2})\otimes\nu g^2_{9/2}$ with 28% probability (2020Od01).
2099.5# *9*	10^+	0.25 ns *15*	BC	$T_{1/2}$: from ce(t) in ^{209}Bi(^{14}N,5nγ). J$^\pi$: E2 γ to 8^+, yrast band member. Configuration=$\pi(h^6_{9/2}f^2_{7/2})\otimes\nu(i^1_{11/2}g^1_{9/2}$ with 26% probability (2020Od01).
2272.6@ *10*	(11^-)		BC	XREF: C(?). J$^\pi$: ΔJ=(1), (E1) γ to 10^+; shell-model prediction (2020Od01). Configuration=$\pi h^8_{9/2}\otimes\nu(g^1_{9/2}j^1_{15/2})$ with 32% probability (2020Od01).
2686.3@ *10*	(13^-)		BC	XREF: C(?). J$^\pi$: ΔJ=(2) γ to (11^-); band member; shell-model prediction (2020Od01). Configuration=$\pi(h^6_{9/2}i^2_{13/2})\otimes\nu(g^1_{9/2}j^1_{15/2})$ with 31% probability (2020Od01).

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Adopted Levels, Gammas (continued)

^{218}Th Levels (continued)

E(level)[†]	J$^{\pi}$[‡]	XREF	Comments
3160.0[@] *12*	(15$^-$)	B	J$^{\pi}$: ΔJ=(2) γ to (13$^-$); band member; shell-model prediction (2020Od01). Configuration=$\pi(h^6_{9/2}i^2_{13/2})\otimes\nu(g^1_{9/2}j^1_{15/2})$ with 37% probability (2020Od01).
3306.7 *13*	(16$^+$)	B	J$^{\pi}$: ΔJ=1, (E1) transition to (15$^-$); shell-model prediction (2020Od01). Configuration=$\pi(h^7_{9/2}f^1_{7/2})\otimes\nu g^2_{9/2}$ with 42% probability (2020Od01).

[†] From Eγ data.
[‡] In addition to the arguments given, the assignments are supported from shell-model calculations in 2020Od01.
[#] Band(A): Yrast (g.s.) band.
[@] Band(B): Band based on (11$^-$).

γ(^{218}Th)

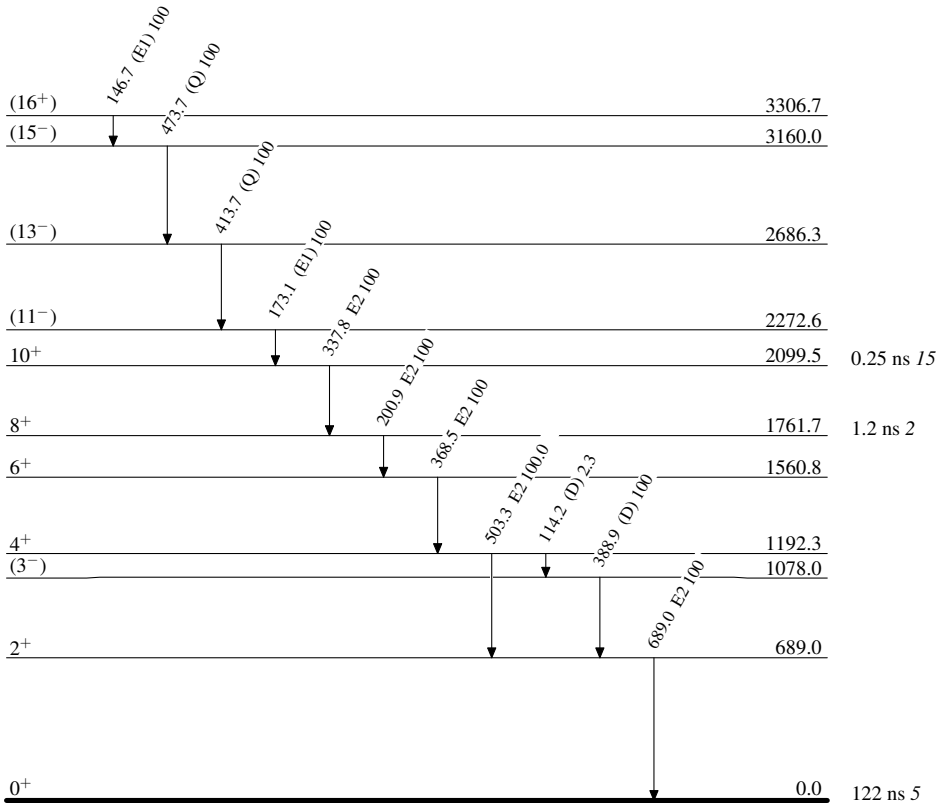
E$_i$(level)	J$_i^{\pi}$	E$_{\gamma}$[†]	I$_{\gamma}$	E$_f$	J$_f^{\pi}$	Mult.	α[&]	Comments
689.0	2$^+$	689.0 *3*	100	0.0	0$^+$	E2[‡]	0.0209	E$_{\gamma}$: 689.6 *6* in (^{16}O,4nγ).
1078.0	(3$^-$)	388.9 *6*	100	689.0	2$^+$	(D)[#]		E$_{\gamma}$: 390.5 *10* in (^{16}O,4nγ).
1192.3	4$^+$	114.2 *7*	2.3 *2*	1078.0	(3$^-$)	(D)[#]		E$_{\gamma}$: from (^{48}Ca,4nγ) only.
		503.3 *3*	100.0 *17*	689.0	2$^+$	E2[‡]	0.0420	E$_{\gamma}$: 504.6 *6* in (^{16}O,4nγ).
1560.8	6$^+$	368.5 *3*	100	1192.3	4$^+$	E2[‡]	0.093	E$_{\gamma}$: 369.7 *6* in (^{16}O,4nγ).
1761.7	8$^+$	200.9 *4*	100	1560.8	6$^+$	E2[‡]	0.648 *11*	B(E2)(W.u.)=11 *2* E$_{\gamma}$: 201.9 *6* in (^{16}O,4nγ).
2099.5	10$^+$	337.8 *5*	100	1761.7	8$^+$	E2[‡]	0.1187	B(E2)(W.u.)=6 *+9−2* E$_{\gamma}$: 338.2 *6* in (^{16}O,4nγ).
2272.6	(11$^-$)	173.1 *4*	100	2099.5	10$^+$	(E1)[@]	0.133 *2*	E$_{\gamma}$: 173.3 *6* in (^{16}O,4nγ).
2686.3	(13$^-$)	413.7 *4*	100	2272.6	(11$^-$)	(Q)[#]		E$_{\gamma}$: 414.5 *10* in (^{16}O,4nγ).
3160.0	(15$^-$)	473.7 *5*	100	2686.3	(13$^-$)	(Q)[#]		E$_{\gamma}$: from (^{48}Ca,nγ) only.
3306.7	(16$^+$)	146.7 *5*	100	3160.0	(15$^-$)	(E1)[@]	0.197 *4*	E$_{\gamma}$: from (^{48}Ca,nγ). An unplaced 146.9 *6* γ was seen in (^{16}O,4nγ).

[†] From ^{174}Yb(^{48}Ca,4nγ). Values in ^{206}Pb(^{16}O,4nγ), ^{209}Bi(^{14}N,5nγ), listed under comments, seem consistently higher by about a keV.
[‡] From K/L ratios in ce data in ^{209}Bi(^{14}N,5nγ), supplemented by ΔJ=2, quadrupole from γ-ray angular distributions in ^{174}Yb(^{48}Ca,4nγ), and by RUL for E2 and M2, when level half-lives are known.
[#] From γ-ray angular distributions in ^{174}Yb(^{48}Ca,4nγ), with mult=(Q) and (D), most likely (E2) and (E1), respectively.
[@] From γ-ray angular distribution in ^{174}Yb(^{48}Ca,4nγ), and intensity balance arguments.
[&] 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

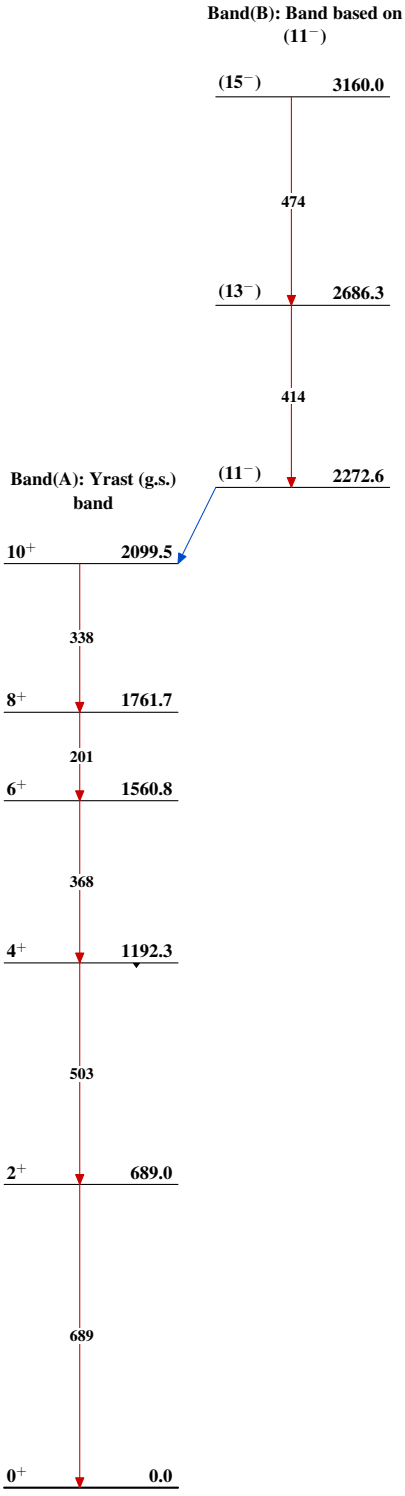
Level Scheme

Intensities: Relative photon branching from each level



$^{218}_{90}Th_{128}$

Adopted Levels, Gammas



$^{218}_{90}Th_{128}$