

Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh et al. ,	NDS 175,1 (2021)	19-May-2021

Q(β⁻)=-4120 90; S(n)=5980 60; S(p)=3680 80; Q(α)=9510 60 2021Wa16
 S(2n)=13890 60, S(2p)=6000 60, Q(εp)=530 60 (2021Wa16).

Additional information 1.

1973Ha32: ²¹⁹Th activity was produced by ²⁰⁶Pb(¹⁶O,3n), E=80-90 MeV. Isotopic assignment was based on its genetic relationship to ²¹⁵Ra, and also on excitation functions. Measured half-life of decay of ²¹⁹Th.

Theoretical calculations: 31 primary references in the NSR database (www.nndc.bnl.gov/nsr), six related to structure calculations, and 25 to radioactivity.

²¹⁹Th Levels

Cross Reference (XREF) Flags

- A ²²³U α decay (59 μs)
- B ¹⁹⁸Pt(²⁶Mg,5nγ)

E(level) [†]	J ^π [‡]	T _{1/2}	XREF	Comments
0.0 [#]	(9/2 ⁺)	1.025 μs 30	AB	%α=100 %ε+%β ⁺ ≈1×10 ⁻⁷ (1973Ta30, theory); 3.8×10 ⁻⁶ (2019Mo01, theory). T _{1/2} : weighted average of 0.90 μs 18 (2020Ma27, ER-α correlations using SHANS separator at HRIFL-Lanzhou); 0.94 μs +21-15 (2020Su02, ER-α correlations using SHANS separator at HRIFL-Lanzhou); 1.24 μs +68-32 (2019Zh54, ER-α correlations using SHANS separator at HRIFL-Lanzhou); 1.03 μs 3 (2019Ya04, ER-α correlations using SHANS separator at HRIFL-Lanzhou); 0.94 μs 8 (2018Br13, ER-α correlated decay curve); 1.09 μs 8 (2017Su18, ER-α-correlated decay curve fitted to a single exponential); 0.97 μs 4 (2015Kh09, fitting of the (ER)-α correlated decay curve for the α peak from ²¹⁹ Th decay to a single exponential); 1.1 μs 1 (2006Pe17, (ER)-α correlated decay curve); and 1.05 μs 3 (1973Ha32, α-decay curve). Note that 2020Ma27, 2020Su02, 2019Zh54, 2019Ya04 and 2017Su18 are from the same lab, but different experiments were performed, using either different reactions, or different optimum mass setting or beam energy if the same reaction was used. J ^π : from systematics of N=129 isotones from ²¹¹ Pb to ²¹⁷ Ra, and comparison of g.s. J ^π values of N=127 and N≥131 Th isotopes with corresponding Ra isotopes. Configuration=vg _{9/2} ³ , seniority=1 state.
244 23	(7/2 ⁺)		A	J ^π : favored α decay (HF=1.0 3) from (7/2 ⁺) ²²³ U parent. 2020Su02 suggested (7/2 ⁺ ,11/2 ⁺), based on systematics of low-lying levels in N=129 isotones. Evaluators prefer (7/2 ⁺) as (11/2 ⁺) is assigned to the 362.5 level.
362.53 ^{&} 25	(11/2 ⁺)		B	
536.67 [#] 25	(13/2 ⁺)		B	
609.9 ^a 4	(13/2 ⁻)		B	
966.9 ^{&} 4	(15/2 ⁺)		B	
968.1 [@] 4	(15/2 ⁻)		B	
1049.3 [#] 4	(17/2 ⁺)		B	
1174.3 ^a 4	(17/2 ⁻)		B	
1375.6 ^{&} 4	(19/2 ⁺)		B	
1436.5 [@] 4	(19/2 ⁻)		B	
1519.5 [#] 5	(21/2 ⁺)		B	
1725.9 ^a 5	(21/2 ⁻)		B	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{219}Th Levels (continued)

<u>E(level)[†]</u>	<u>J^π[‡]</u>	<u>XREF</u>
1752.3 ^{& 5}	(23/2 ⁺)	B
1968.6 ⁶	(27/2 ⁺)	B
1974.4 ^{# 6}	(25/2 ⁺)	B
2322.0 ⁷	(29/2 ⁺)	B

[†] From least-squares fit to E γ data, assuming 0.3 keV uncertainty for each γ ray.

[‡] As assigned in [2009Re09](#) based on quadrupole-octupole, parity-doublet band structures; parentheses added by evaluators due to lack of detailed information about multipolarity assignments.

[#] Band(A): Band based on 9/2⁺, s=+i. Configuration= $\nu g_{9/2}^3$.

[@] Band(a): Band based on 15/2⁻, s=+i. Parity doublet band with 9/2⁺ band. Configuration= $\nu g_{9/2}^3 \otimes$ (octupole phonon).

[&] Band(B): Band based on 11/2⁺, s=-i. Configuration= $\nu i_{11/2} \otimes \nu g_{9/2}^2$.

^a Band(b): Band based on 13/2⁻, s=-i. Parity doublet band with 11/2⁺ band. Configuration= $\nu i_{11/2} \otimes \nu g_{9/2}^2 \otimes$ (octupole phonon).

$\gamma(^{219}\text{Th})$

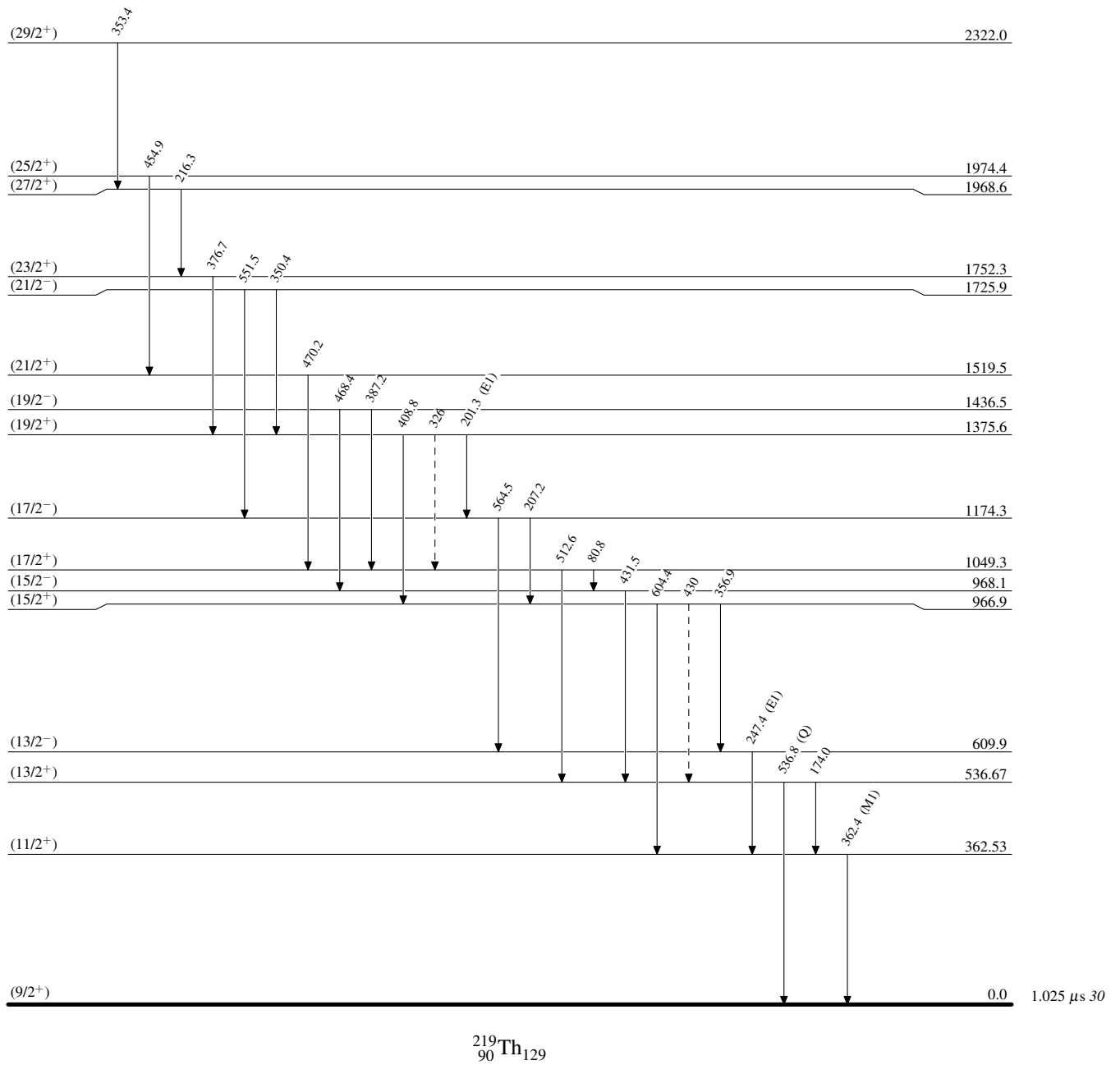
<u>E_i(level)</u>	<u>J_i^π</u>	<u>Eγ</u>	<u>E_f</u>	<u>J_f^π</u>	<u>Mult.[†]</u>	<u>E_i(level)</u>	<u>J_i^π</u>	<u>Eγ</u>	<u>E_f</u>	<u>J_f^π</u>	<u>Mult.[†]</u>
362.53	(11/2 ⁺)	362.4	0.0	(9/2 ⁺)	(M1)	1375.6	(19/2 ⁺)	201.3	1174.3	(17/2 ⁻)	(E1)
536.67	(13/2 ⁺)	174.0	362.53	(11/2 ⁺)				326 [‡]	1049.3	(17/2 ⁺)	
		536.8	0.0	(9/2 ⁺)	(Q)			408.8	966.9	(15/2 ⁺)	
609.9	(13/2 ⁻)	247.4	362.53	(11/2 ⁺)	(E1)	1436.5	(19/2 ⁻)	387.2	1049.3	(17/2 ⁺)	
966.9	(15/2 ⁺)	356.9	609.9	(13/2 ⁻)				468.4	968.1	(15/2 ⁻)	
		430 [‡]	536.67	(13/2 ⁺)		1519.5	(21/2 ⁺)	470.2	1049.3	(17/2 ⁺)	
		604.4	362.53	(11/2 ⁺)		1725.9	(21/2 ⁻)	350.4	1375.6	(19/2 ⁺)	
968.1	(15/2 ⁻)	431.5	536.67	(13/2 ⁺)				551.5	1174.3	(17/2 ⁻)	
1049.3	(17/2 ⁺)	80.8	968.1	(15/2 ⁻)		1752.3	(23/2 ⁺)	376.7	1375.6	(19/2 ⁺)	
		512.6	536.67	(13/2 ⁺)		1968.6	(27/2 ⁺)	216.3	1752.3	(23/2 ⁺)	
1174.3	(17/2 ⁻)	207.2	966.9	(15/2 ⁺)		1974.4	(25/2 ⁺)	454.9	1519.5	(21/2 ⁺)	
		564.5	609.9	(13/2 ⁻)		2322.0	(29/2 ⁺)	353.4	1968.6	(27/2 ⁺)	

[†] From $\gamma\gamma$ (lin pol) and/or from intensity balance in $^{198}\text{Pt}(^{26}\text{Mg},5n\gamma)$.

[‡] Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

Legend

Level Scheme-----► γ Decay (Uncertain)

Adopted Levels, Gammas**Band(A): Band based on**
 $9/2^+, s=+i$ $(25/2^+)$ 1974.4

455

 $(21/2^+)$ 1519.5

470

 $(17/2^+)$ 1049.3

513

 $(13/2^+)$ 536.67

537

 $(9/2^+)$ 0.0**Band(a): Band based on**
 $15/2^-, s=+i$ $(19/2^-)$ 1436.5

468

 $(15/2^-)$ 968.1**Band(B): Band based on**
 $11/2^+, s=-i$ $(23/2^+)$ 1752.3

377

 $(19/2^+)$ 1375.6

409

 $(15/2^+)$ 966.9

604

 $(11/2^+)$ 362.53**Band(b): Band based on**
 $13/2^-, s=-i$ $(21/2^-)$ 1725.9

552

 $(17/2^-)$ 1174.3

564

 $(13/2^-)$ 609.9 $^{219}\text{Th}_{129}$