^{230}Th(n,γ) E=th:primary γ 1987Wh01

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh, Jagdish K. Tuli, and Edgardo Browne	NDS 185, 560 (2022)	31-Aug-2022

1987Wh01: measured secondary gammas from (n,γ) E=th using curved-crystal spectrometer GAMS1 and GAMS2/3 at ILL, Grenoble with FWHM=20 eV at 100 keV, and 210 eV at 500 keV. Eγ calibrated relative to Th Kα_1 x ray=93.3483 keV. Measured conversion electrons using BILL β-ray magnetic spectrometer at ILL, Grenoble, with a momentum resolution of 5×10^{-4}. Primary γ rays from (n,γ) E=th and E(n)=2 keV were measured using a three-crystal pair spectrometer (one Ge detector and two NaI(Tl) detectors) at Grenoble with FWHM=5.5 keV at Eγ=4.5 MeV.

See ^{230}Th(n,γ) E=th dataset for complete details about secondary γ-ray data, band and Nilsson configuration assignments for levels.

^{231}Th Levels

E(level)[†]	J$^\pi$[#]	Comments
0.0	5/2$^+$[@]	
41.952 *2*	7/2$^+$[@]	
96.129 *3*	9/2$^+$[@]	
185.715 *2*	5/2$^-$[@]	
205.310 *2*	(7/2$^-$)[@]	
221.398 *2*	3/2$^+$[@]	
236.954 *31*	9/2$^-$[@]	
240.881 *2*	5/2$^+$[@]	
247.583 *2*	1/2$^+$[@]	
272.180 *2*	3/2$^+$[@]	
275.425 *2*	7/2$^+$[@]	
301.744 *2*	5/2$^+$[@]	
317.082 *2*	5/2$^+$[&]	
324.913 *7*	(9/2)$^+$	J$^\pi$: 9/2$^+$ in 1987Wh01.
348.7[‡]	1/2$^+$,3/2$^+$[*b*]	
351.511 *6*	7/2$^+$	
377.577 *8*	(7/2)$^+$	J$^\pi$: 7/2$^+$ in 1987Wh01.
380.0[‡] *3*	1/2$^+$,3/2$^+$[*b*]	
387.827 *2*	7/2$^-$[@]	
501.1[‡] *5*		
510.897? *10*	(7/2)$^+$	J$^\pi$: 7/2$^+$ in 1987Wh01.
536.7[‡] *7*		
554.651 *2*	(1/2)$^-$[@]	J$^\pi$: 1/2$^-$ in 1987Wh01.
590.838 *2*	3/2$^-$[@]	
593.617 *2*	(3/2)$^-$[@]	J$^\pi$: 3/2$^-$ in 1987Wh01.
595.974 *2*	5/2$^-$	
619.638 *4*	3/2$^-$[*a*]	
623.937? *18*	5/2$^-$[*a*]	
629.342 *2*	(5/2)$^-$	J$^\pi$: 5/2$^-$ in 1987Wh01.
634.044? *13*	(7/2$^-$)[*a*]	J$^\pi$: 7/2$^-$ in 1987Wh01.
655.981? *25*	7/2$^-$[@]	
684.490 *2*	(5/2)$^-$[*a*]	J$^\pi$: 5/2$^-$ in 1987Wh01.
687.631 *3*	1/2$^+$	
693.46[‡] *17*		
709.099 *4*	3/2$^+$	
713.753 *2*	3/2$^-$[&]	

Continued on next page (footnotes at end of table)

^{230}Th(n,γ) E=th:primary γ 1987Wh01 (continued)

^{231}Th Levels (continued)

E(level)[†]	J$^{\pi}$[#]	Comments
720.298 *5*	(7/2)$^{-}$[&]	J$^{\pi}$: 7/2^{-} in 1987Wh01.
735.263 *6*	(5/2)$^{+}$	J$^{\pi}$: 5/2^{+} in 1987Wh01.
793.026 *4*	1/2^{+}	
808.507 *8*	3/2^{+}	
820.544 *7*	1/2^{+}[&]	
833.168 *4*	(1/2)$^{-}$[&]	J$^{\pi}$: 1/2^{-} in 1987Wh01.
839.304 *8*	3/2^{+}[&]	
846.3[‡] *4*	(1/2^{+},3/2^{+})	
867.03 *4*	5/2^{-},7/2^{-}	
875.549 *4*	(3/2)$^{-}$	J$^{\pi}$: 3/2^{-} in 1987Wh01.
889.998 *12*	5/2^{+}	J$^{\pi}$: 7/2^{+} in 1987Wh01.
899.2[‡] *6*		
914.904 *40*	(5/2)$^{-}$	J$^{\pi}$: 5/2^{-} in 1987Wh01.
936.305 *10*	(5/2)$^{-}$	J$^{\pi}$: 5/2^{-} in 1987Wh01.
942.2[‡] *9*		
960.807 *11*	3/2^{+}	
1004.236 *20*	3/2^{+}	
1020.728 *5*	3/2^{-}	
1033.0[‡] *3*	(1/2^{+})[b]	
1056.30 *3*	(3/2^{+})	J$^{\pi}$: 3/2^{+} in 1987Wh01.
1066.19 *2*	(5/2,7/2)$^{+}$	J$^{\pi}$: (5/2)$^{+}$ in 1987Wh01.
1074.35 *2*	(3/2)$^{-}$	J$^{\pi}$: 3/2^{-} in 1987Wh01.
1081.33 *2*	1/2^{-},3/2^{-}	
1086.812 *10*	5/2^{+}	
1094.22[‡] *23*	1/2^{-},3/2^{-}[b]	
1102.25 *1*	3/2^{-}	
1133.81 *8*	(1/2^{+},3/2^{+})	J$^{\pi}$: (1/2^{+},3/2^{+},5/2^{+}) in 1987Wh01.
1155.5[‡] *4*		
1159.750 *7*	(3/2)$^{-}$	J$^{\pi}$: 1/2^{-},3/2^{-} in 1987Wh01.
1173.00 *2*	3/2^{-}	
1193.2[‡] *8*		
1200.38[‡] *17*	1/2,3/2[b]	
1213.83[‡] *21*		
1219.02[‡] *24*	(1/2^{+},3/2^{+})[b]	
1251.43[‡] *17*		
1274.5[‡] *4*	1/2^{-},3/2^{-}[b]	
(5118.13 *20*)	1/2^{+}	E(level): S(n)(^{231}Th)=5118.02 *20* (2021Wa16).

[†] From ^{230}Th(n,γ) E=th dataset.
[‡] No secondary γ rays are known from this level. Also, this level is reported only in (n,γ),E=th or E=2 keV:ARC.
[#] From the Adopted Levels, unless otherwise stated.
[@] From well-established Nilsson configuration (1987Wh01).
[&] From probable Nilsson configuration (1987Wh01).
[a] From possible Nilsson configuration (1987Wh01).
[b] From 1987Wh01, based on γ-ray deexcitation and γ-ray intensities in average resonance capture.

^{230}Th(n,γ) E=th:primary γ 1987Wh01 (continued)

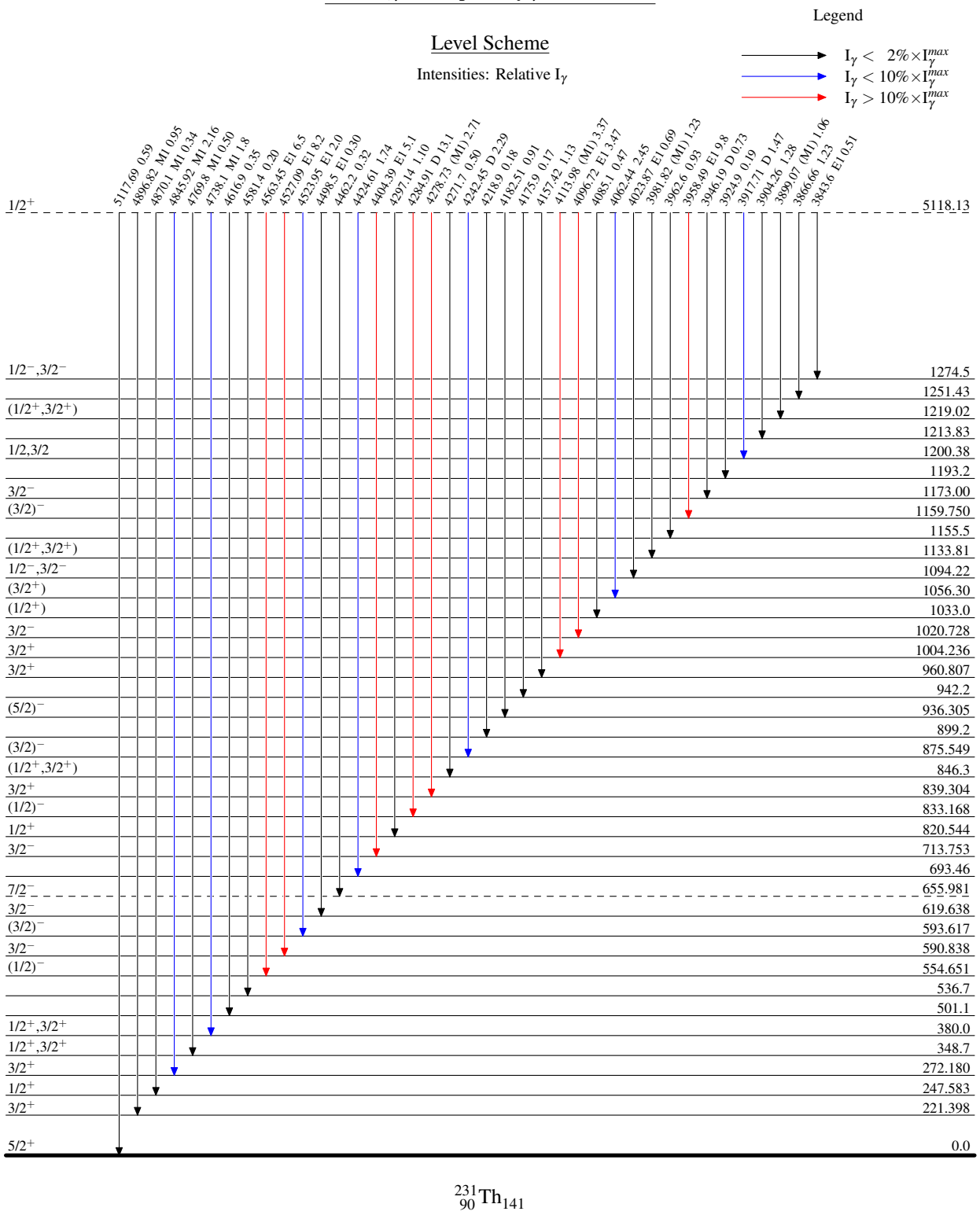
$\gamma(^{231}Th)$

All data are from 1987Wh01, unless otherwise stated.

E_γ	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	Comments
3843.6[#] *4*	0.51 *8*	(5118.13)	$1/2^+$	1274.5	$1/2^-$,$3/2^-$	E1	
3866.66[#] *17*	1.23 *9*	(5118.13)	$1/2^+$	1251.43			
3899.07[#] *24*	1.06 *10*	(5118.13)	$1/2^+$	1219.02	($1/2^+$,$3/2^+$)	(M1)	
3904.26[#] *21*	1.28 *10*	(5118.13)	$1/2^+$	1213.83			
3917.71[#] *17*	1.47 *10*	(5118.13)	$1/2^+$	1200.38	1/2,3/2	D	
3924.9[#] *8*	0.19 *6*	(5118.13)	$1/2^+$	1193.2			
3946.19 *24*	0.73 *7*	(5118.13)	$1/2^+$	1173.00	$3/2^-$	D	
3958.49 *12*	9.8 *5*	(5118.13)	$1/2^+$	1159.750	$(3/2)^-$	E1	
3962.6[#] *4*	0.93 *15*	(5118.13)	$1/2^+$	1155.5			
3981.82 *17*	1.23 *9*	(5118.13)	$1/2^+$	1133.81	($1/2^+$,$3/2^+$)	(M1)	E_γ: based on γ-ray placement, level-energy difference is 3984.32 *22*. See also comment for this γ in the Adopted dataset, where recommended Eγ=3984.31 *9*.
4023.87[#] *23*	0.69 *7*	(5118.13)	$1/2^+$	1094.22	$1/2^-$,$3/2^-$	E1	
4062.44 *13*	2.45 *14*	(5118.13)	$1/2^+$	1056.30	$(3/2^+)$		E_γ: γ-ray placement requires Eγ=4061.79 *4*.
4085.1[#] *3*	0.47 *6*	(5118.13)	$1/2^+$	1033.0	$(1/2^+)$		
4096.72 *13*	3.47 *19*	(5118.13)	$1/2^+$	1020.728	$3/2^-$	E1	E_γ: γ-ray placement requires Eγ=4097.32 *3*.
4113.98 *13*	3.37 *19*	(5118.13)	$1/2^+$	1004.236	$3/2^+$	(M1)	
4157.42 *17*	1.13 *8*	(5118.13)	$1/2^+$	960.807	$3/2^+$		
4175.9[#] *9*	0.17 *5*	(5118.13)	$1/2^+$	942.2			
4182.51[#] *19*	0.91 *7*	(5118.13)	$1/2^+$	936.305	$(5/2)^-$		
4218.9[#] *6*	0.18 *4*	(5118.13)	$1/2^+$	899.2			
4242.45 *15*	2.29 *15*	(5118.13)	$1/2^+$	875.549	$(3/2)^-$	D	
4271.7 *4*	0.50 *7*	(5118.13)	$1/2^+$	846.3	($1/2^+$,$3/2^+$)		
4278.73 *17*	2.71 *18*	(5118.13)	$1/2^+$	839.304	$3/2^+$	(M1)	
4284.91 *12*	13.1 *7*	(5118.13)	$1/2^+$	833.168	$(1/2)^-$	D	
4297.14 *21*	1.10 *10*	(5118.13)	$1/2^+$	820.544	$1/2^+$		
4404.39 *11*	5.1 *3*	(5118.13)	$1/2^+$	713.753	$3/2^-$	E1	
4424.61[#] *17*	1.74 *12*	(5118.13)	$1/2^+$	693.46			
4462.2 *3*	0.32 *4*	(5118.13)	$1/2^+$	655.981?	$7/2^-$		
4498.5 *3*	0.30 *5*	(5118.13)	$1/2^+$	619.638	$3/2^-$	E1	
4523.95 *25*	2.0 *3*	(5118.13)	$1/2^+$	593.617	$(3/2)^-$	E1	
4527.09 *11*	8.2 *5*	(5118.13)	$1/2^+$	590.838	$3/2^-$	E1	
4563.45 *9*	6.5 *3*	(5118.13)	$1/2^+$	554.651	$(1/2)^-$	E1	
4581.4[#] *7*	0.20 *4*	(5118.13)	$1/2^+$	536.7			
4616.9[#] *5*	0.35 *5*	(5118.13)	$1/2^+$	501.1			
4738.1[#] *3*	1.8 *3*	(5118.13)	$1/2^+$	380.0	$1/2^+$,$3/2^+$	M1	
4769.8[#] *5*	0.50 *8*	(5118.13)	$1/2^+$	348.7	$1/2^+$,$3/2^+$	M1	
4845.92 *6*	2.16 *11*	(5118.13)	$1/2^+$	272.180	$3/2^+$	M1	
4870.1 *3*	0.34 *4*	(5118.13)	$1/2^+$	247.583	$1/2^+$	M1	
4896.82 *21*	0.95 *8*	(5118.13)	$1/2^+$	221.398	$3/2^+$	M1	
5117.69 *17*	0.59 *4*	(5118.13)	$1/2^+$	0.0	$5/2^+$		

[†] Relative intensities (1987Wh01).
[‡] For multipolarities of primary γ rays from average resonance capture, see 1987Wh01 (these were deduced from average reduced intensities).
[#] Primary γ populates a level from which no secondary γ rays are known.

^{230}Th(n,γ) E=th:primary γ 1987Wh01



$^{231}_{90}Th_{141}$