

$^{230}\text{Th}(\text{n},\gamma)$ E=2 keV:arc **1987Wh01**

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

1987Wh01: target: 83.86% enriched ^{230}Th . Measured capture γ -rays using three-crystal pair spectrometer at the Brookhaven National Laboratory High-Flux BeamReactor, with FWHM=5.5 keV at 4500 keV. E(n)=2 keV average energy.

 ^{231}Th Levels

E(level)	J^π [‡]	Comments
221.4 7	$1/2^+, 3/2^+$	
247.2 7	$1/2^+, 3/2^+$	
272.0 7	$1/2^+, 3/2^+$	
349.7?† 10	$(1/2^+, 3/2^+)$	
386.5?† 5	$(1/2^+, 3/2^+)$	
555.0 3	$1/2^-, 3/2^-$	
591.4 7	$1/2^-, 3/2^-$	
595.2 9	$1/2^-, 3/2^-$	
619.9 3	$1/2^-, 3/2^-$	
685.6 5	$1/2, 3/2$	
713.2 3	$1/2^-, 3/2^-$	
794.2 12	$1/2^+, 3/2^+$	
834.5 8	$1/2, 3/2$	
840.1 14	$1/2, 3/2$	
843.7?† 16	$(1/2^+, 3/2^+)$	
869.9† 11	$1/2, 3/2$	
874.9 10	$1/2, 3/2$	
1003.8 5	$1/2, 3/2$	
1021.0 3	$1/2^-, 3/2^-$	
1075.1 8	$1/2, 3/2$	
1081.2 9	$1/2, 3/2$	
1103.3 4	$1/2^-, 3/2^-$	
1134.3 26	$(1/2^+, 3/2^+)$	
1159.1 4	$1/2^-, 3/2^-$	
1172.7 6	$1/2, 3/2$	
1202.0 8	$1/2, 3/2$	
1219.1 32	$(1/2^+, 3/2^+)$	
1222.0 29	$(1/2^+, 3/2^+)$	
1271.3 6	$1/2^-, 3/2^-$	
(5120.0 2)	$1/2^+$	E(level): S(n)+E(n), S(n)=5118.02 keV 20 (2021Wa16), E(n)=2 keV. J ^π : s-wave n-capture in 0 ⁺ g.s. of ^{230}Th .

† **1987Wh01** state that, although the ARC spectrum was checked rigorously for the presence of contaminant lines, peaks populating levels at 349.7, 386.5, 843.7 and 869.9 keV may possibly be spurious as no evidence for level populated by this transition was found in other experimental studies. Later (d,t) work by **2008Bu14** found a level at 868.6 keV with L(d,t)=1, which may correspond to the 869.9 level in the work by **1987Wh01**.

‡ Based on M1, E1 or dipole multipolarities of capture γ rays from $J^\pi=1/2^+$ neutron resonances.

$^{230}\text{Th}(\text{n},\gamma) \text{E}=2 \text{ keV:arc}$ **1987Wh01** (continued)

$\gamma(^{231}\text{Th})$						
$E_\gamma^\ddagger$	$I_\gamma^\oplus$	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult. [†]
3848.7 6	14 3	(5120.0)	$1/2^+$	1271.3	$1/2^-, 3/2^-$	E1
3898.0 29	8 3	(5120.0)	$1/2^+$	1222.0	$(1/2^+, 3/2^+)$	(M1)
3900.9 32	7 3	(5120.0)	$1/2^+$	1219.1	$(1/2^+, 3/2^+)$	(M1)
3918.0 8	11 3	(5120.0)	$1/2^+$	1202.0	$1/2, 3/2$	D
3947.3 6	17 4	(5120.0)	$1/2^+$	1172.7	$1/2, 3/2$	D
3960.9 4	23 3	(5120.0)	$1/2^+$	1159.1	$1/2^-, 3/2^-$	E1
3985.7 26	9 3	(5120.0)	$1/2^+$	1134.3	$(1/2^+, 3/2^+)$	(M1)
4016.7 4	29 3	(5120.0)	$1/2^+$	1103.3	$1/2^-, 3/2^-$	E1
4038.8 9	12 4	(5120.0)	$1/2^+$	1081.2	$1/2, 3/2$	D
4044.9 8	15 4	(5120.0)	$1/2^+$	1075.1	$1/2, 3/2$	D
4099.0 3	34 4	(5120.0)	$1/2^+$	1021.0	$1/2^-, 3/2^-$	E1
4116.3 5	18 3	(5120.0)	$1/2^+$	1003.8	$1/2, 3/2$	D
4245.1 10	15 5	(5120.0)	$1/2^+$	874.9	$1/2, 3/2$	D
4250.1 [#] 11	13 5	(5120.0)	$1/2^+$	869.9	$1/2, 3/2$	D
4276.3 ^{#&} 16	9 4	(5120.0)	$1/2^+$	843.7?	$(1/2^+, 3/2^+)$	M1
4279.9 14	13 6	(5120.0)	$1/2^+$	840.1	$1/2, 3/2$	D
4285.5 8	16 4	(5120.0)	$1/2^+$	834.5	$1/2, 3/2$	D
4325.9 12	7 3	(5120.0)	$1/2^+$	794.2	$1/2^+, 3/2^+$	M1
4406.7 3	34 3	(5120.0)	$1/2^+$	713.2	$1/2^-, 3/2^-$	E1
4434.3 5	20 3	(5120.0)	$1/2^+$	685.6	$1/2, 3/2$	D
4500.0 3	37 3	(5120.0)	$1/2^+$	619.9	$1/2^-, 3/2^-$	E1
4524.7 9	28 12	(5120.0)	$1/2^+$	595.2	$1/2^-, 3/2^-$	E1
4528.5 7	42 12	(5120.0)	$1/2^+$	591.4	$1/2^-, 3/2^-$	E1
4564.9 3	31 3	(5120.0)	$1/2^+$	555.0	$1/2^-, 3/2^-$	E1
4733.4 ^{#&} 5	17 3	(5120.0)	$1/2^+$	386.5?	$(1/2^+, 3/2^+)$	M1
4770.2 ^{#&} 10	8 3	(5120.0)	$1/2^+$	349.7?	$(1/2^+, 3/2^+)$	M1
4847.9 7	12 3	(5120.0)	$1/2^+$	272.0	$1/2^+, 3/2^+$	M1
4872.7 7	13 3	(5120.0)	$1/2^+$	247.2	$1/2^+, 3/2^+$	M1
4898.5 7	15 3	(5120.0)	$1/2^+$	221.4	$1/2^+, 3/2^+$	M1

[†] Deduced from reduced γ -ray intensities.

[‡] Measured energies of primary γ rays are not listed by **1987Wh01**. Evaluators deduce these from $S(\text{n})=5118.02 \text{ 20}$ (**2021Wa16**), $E(\text{n})=2 \text{ keV}$, and $E(\text{level})$ listed in Table III of **1987Wh01**, decorrected for recoil.

[#] **1987Wh01** state that, although the ARC spectrum was checked rigorously for the presence of contaminant lines, peaks populating levels at 349.7, 386.5, 843.7 and 869.9 keV may possibly be spurious as no evidence for level populated by this transition was found in other experimental studies. Later (d,t) work by **2008Bu14** found a level at 868.6 keV with $L(\text{d,t})=1$, which may correspond to the 869.9 level in the work by **1987Wh01**.

[@] Relative intensities of primary γ rays are given by **1987Wh01**.

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

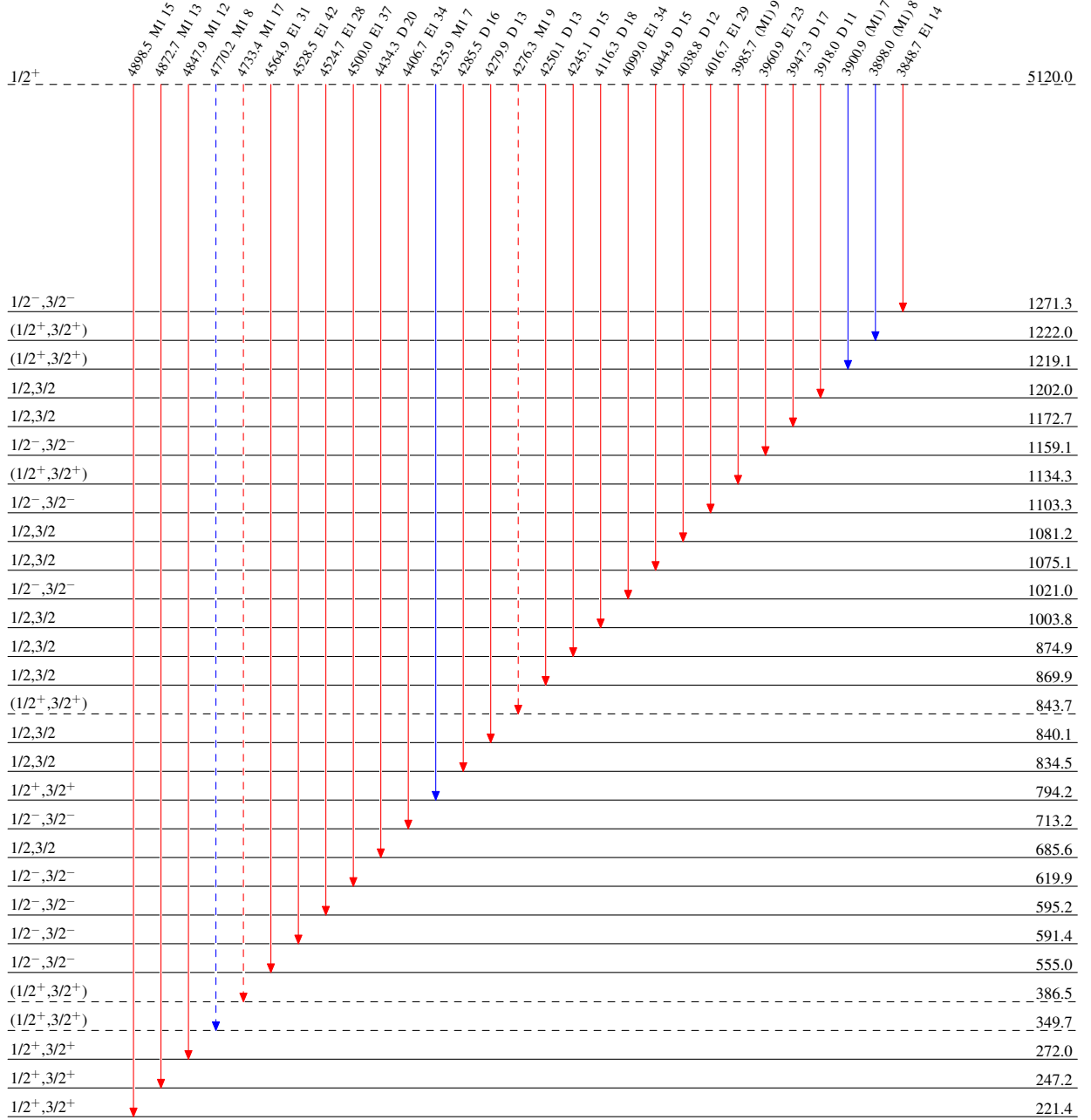
$^{230}\text{Th}(n,\gamma) \text{ E}=2 \text{ keV:arc}$ 1987Wh01

Legend

Level Scheme

Intensities: Relative I_γ

- $\longrightarrow$ $I_\gamma < 2\% \times I_\gamma^{\max}$
 $\longrightarrow$ $I_\gamma < 10\% \times I_\gamma^{\max}$
 $\longrightarrow$ $I_\gamma > 10\% \times I_\gamma^{\max}$
 $\longrightarrow$ γ Decay (Uncertain)

 $^{231}_{90}\text{Th}_{141}$