$$^{208}\text{Pb}(^{16}\text{O},3n\gamma) \text{ E=78-89 MeV} \quad \textbf{1988Da15,1985Da11}$$

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Ashok Jain, Sukhjeet Singh, Suresh Kumar, Jagdish Tuli	NDS 108, 883 (2007)	15-Jan-2007

The following gammas could not be assigned to either ^{220}Th or ^{221}Th:

Eγ	Iγ	Eγ	Iγ
145.1 5	2.7 4	256.1 3	2.0 5
152.2 3	3.3 4	284.4 3	5.0 5
161.5 5	4.2 1	295.9 3	6.0 5
166.3 3	1.7 3	423.1 3	10 1
184.2 3	5 1	440.2×	12 1
191.8 3	2.3 3	461.2 5	5.0 5
221.7 3	4 1	466.3 7	<1
239.4 5	5.0 5	503.2 3	<1.5
243.2(a)	7 1		
246.6 3	1.8 4		
254.3 3	7.3 5	(a)unresolved doublet	

^{221}Th Levels

E(level)	J$^{\pi \dagger}$	E(level)	J$^{\pi \dagger}$	E(level)	J$^{\pi \dagger}$
0.0‡	(J+)	746.8$^{\#}$ 5	(J+5$^-$)	1472.1$^{\#}$ 6	(J+9$^-$)
250.9‡ 3	(J+2$^+$)	946.5‡ 5	(J+6$^+$)	1776.6‡ 7	(J+10$^+$)
488.0$^{\#}$ 4	(J+3$^-$)	1078.8$^{\#}$ 6	(J+7$^-$)	1935.6$^{\#}$ 7	(J+11$^-$)
572.8‡ 4	(J+4$^+$)	1356.2‡ 6	(J+8$^+$)	2251.4‡ 7	(J+12$^+$)
				2421.5$^{\#}$ 7	(J+13$^-$)

† Assigned by 1988Da15 from γ-ray multipolarities.
‡ Band(A): probably positive parity, K=1/2 g.s. band.
$^{\#}$ Band(B): probably parity doublet of g.s. band.

$\gamma(^{221}$Th)

E$_\gamma^{\dagger}$	I$_\gamma^{\ddagger}$	E$_i$(level)	J$^\pi_i$	E$_f$	J$^\pi_f$	Mult.$^{\#}$	$\alpha^{\&}$
84.8 3	28 3	572.8	(J+4$^+$)	488.0	(J+3$^-$)	E1	0.184
116.0 3	15 1	1472.1	(J+9$^-$)	1356.2	(J+8$^+$)	E1	0.352
132.1 3	33 1	1078.8	(J+7$^-$)	946.5	(J+6$^+$)	E1	0.257
159.0 3	6.5 10	1935.6	(J+11$^-$)	1776.6	(J+10$^+$)	E1	0.165
170.4 3	2.3 3	2421.5	(J+13$^-$)	2251.4	(J+12$^+$)	[E1]	0.1396
174.1 3	59 2	746.8	(J+5$^-$)	572.8	(J+4$^+$)	E1	0.132
199.6 3	37 2	946.5	(J+6$^+$)	746.8	(J+5$^-$)	E1	0.0957
237.1 3	45 2	488.0	(J+3$^-$)	250.9	(J+2$^+$)	E1	0.0640
250.9 3	100	250.9	(J+2$^+$)	0.0	(J+)	E2	0.304
258.9^a 3	4.3 6	746.8	(J+5$^-$)	488.0	(J+3$^-$)	[E2]	0.274
^{x}274.8 3	9 1						
277.4 3	19 1	1356.2	(J+8$^+$)	1078.8	(J+7$^-$)	E1	0.0447
304.4 3	11 1	1776.6	(J+10$^+$)	1472.1	(J+9$^-$)	E1	0.0363
316.1 3	6 1	2251.4	(J+12$^+$)	1935.6	(J+11$^-$)	E1	0.0334
321.9 3	48 2	572.8	(J+4$^+$)	250.9	(J+2$^+$)	E2	0.139

$^{208}\text{Pb}(^{16}\text{O,3n}\gamma)$ E=78-89 MeV   1988Da15,1985Da11 (continued)

$\gamma(^{221}\text{Th})$ (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	α[&]	Comments
^{x}332.1[@][a] 3	18 2							
332.1[@] 3	12 2	1078.8	(J+7$^-$)	746.8	(J+5$^-$)	[E2]	0.127	
^{x}336.1[a] 7								Unresolved doublet; assigned to ^{220}Th and tentatively ^{221}Th. The measured intensity for the doublet was Iγ=14 1.
^{x}344.5[a] 3	8 1							
373.6 5	10 3	946.5	(J+6$^+$)	572.8	(J+4$^+$)	E2	0.0911	
^{x}390.0 10	6 1							Unresolved doublet. Iγ possibly includes other γ intensity assigned tentatively to ^{220}Th.
393.3 3	13 1	1472.1	(J+9$^-$)	1078.8	(J+7$^-$)	E2	0.0793	
409.5[a] 3	1.7 6	1356.2	(J+8$^+$)	946.5	(J+6$^+$)	[E2]	0.0713	
^{x}414.0[a] 3	10 1							Assignment to ^{221}Th is not certain.
420.3[a] 10	<1.5	1776.6	(J+10$^+$)	1356.2	(J+8$^+$)	[E2]	0.0666	
463.5 5	7 1	1935.6	(J+11$^-$)	1472.1	(J+9$^-$)	E2	0.0521	
475.0[a] 11	<1	2251.4	(J+12$^+$)	1776.6	(J+10$^+$)	[E2]	0.0491	
485.7 3	9 1	2421.5	(J+13$^-$)	1935.6	(J+11$^-$)	[E2]	0.0465	

[†] From 1988Da15.

[‡] From 1988Da15; relative photon intensities were normalized to 100 at the 250.9γ.

[#] Determined by 1988Da15 from ce intensities and from γ angular distributions. Multipolarities in square brackets were assumed; they could not be experimentally confirmed (1988Da15).

[@] γ was doublet (1988Da15).

[&] 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.

[a] Placement of transition in the level scheme is uncertain.
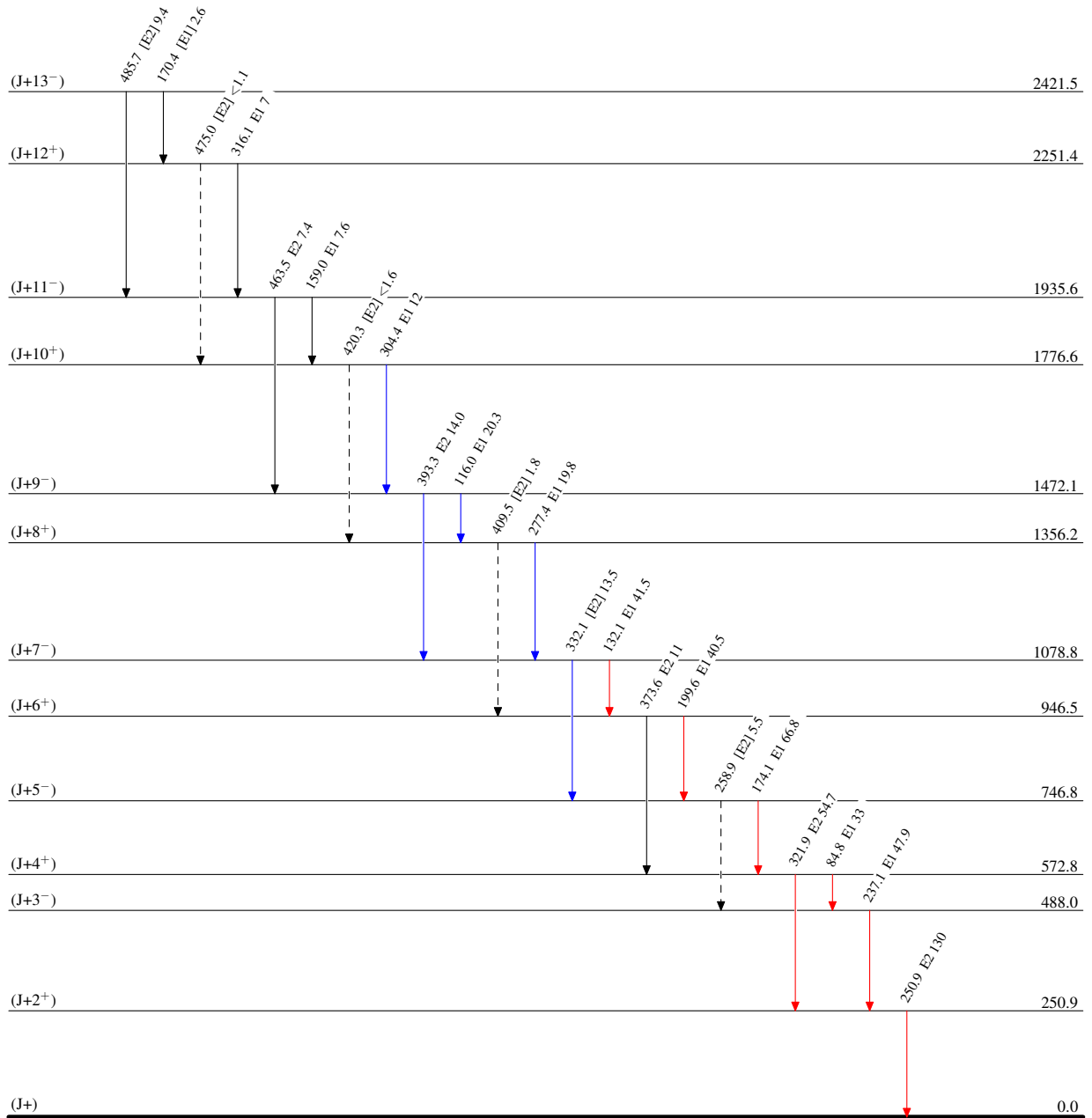
[x] γ ray not placed in level scheme.

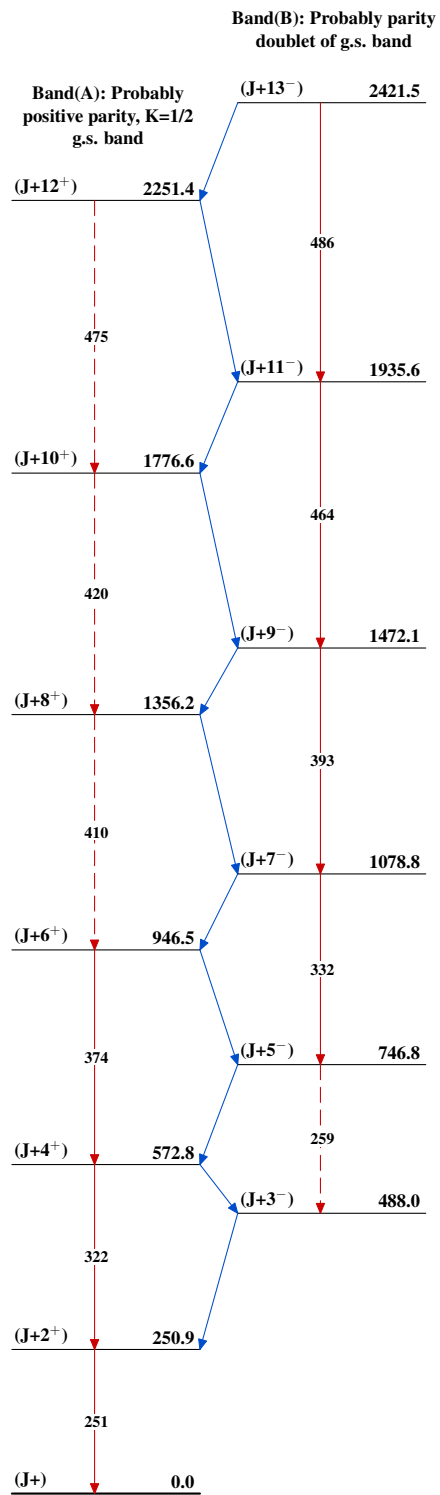^{208}Pb(^{16}O,3nγ) E=78-89 MeV   1988Da15,1985Da11

Legend

Level Scheme

Intensities: Relative I$_{(\gamma+ce)}$

I$_\gamma$ < 2%×I$_\gamma^{max}$
I$_\gamma$ < 10%×I$_\gamma^{max}$
I$_\gamma$ > 10%×I$_\gamma^{max}$
γ Decay (Uncertain)

$^{221}_{90}$Th$_{131}$

$^{208}\text{Pb}(^{16}\text{O},3n\gamma)$ E=78-89 MeV   1988Da15,1985Da11

Band(B): Probably parity doublet of g.s. band

Band(A): Probably positive parity, K=1/2 g.s. band

$(J+13^-)$ 2421.5

$(J+12^+)$ 2251.4

486

475

$(J+11^-)$ 1935.6

$(J+10^+)$ 1776.6

464

420

$(J+9^-)$ 1472.1

$(J+8^+)$ 1356.2

393

410

$(J+7^-)$ 1078.8

$(J+6^+)$ 946.5

332

374

$(J+5^-)$ 746.8

$(J+4^+)$ 572.8

259

$(J+3^-)$ 488.0

322

$(J+2^+)$ 250.9

251

$(J+)$ 0.0

$^{221}_{90}\text{Th}_{131}$