^{231}Pa(p,t)   **1994Le22**

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. Browne, J. K. Tuli	NDS 109, 2657 (2008)	1-Jun-2008

1994Le22: E=22 MeV, measured $T_{1/2}(\theta)$, CCBA.
1982Ah08: E=16.5 MeV.

^{229}Pa Levels

E(level)	$J^{\pi\dagger}$	L	Comments
0^e	5/2$^+$		
x‡	3/2$^-$	0	E(level): x=11.6 3 (1998Le15), 19 9 (1994Le22).
15.1+x$^\#$ 4	1/2$^-$	2	
56.1+x‡ 3	7/2$^-$	2	
87.7+x$^\#$ 3	5/2$^-$	2	
125.1+x 4	(5/2$^-$)	2	J^π: Suggested configuration=5/2[523]+5/2[512].
			E(level): 140 2, 1/2$^-$ in 1982Ah08.
128? 15			E(level): J^π=3/2$^-$, reported in 1982Ah08, not in 1994Le22.
			J^π: strongest peak in the spectrum; therefore, it populates the same state as the ^{231}Pa target ground state (1982Ah08).
166.1+x‡ 3	11/2$^-$	4	E(level): 187 3, 7/2$^-$ in 1982Ah08.
208.3+x$^\#$ 4	9/2$^-$	4	E(level): 217 3, 5/2$^-$ in 1982Ah08.
240.3+x$^@$ 5	1/2$^+$	1	
272.5+x$^@$ 3	5/2$^+$	3	
291.4+x$^\&$ 3	3/2$^+$	3	
326.3+x‡ 3	15/2$^-$	6	
365.1+x$^@$ 3	9/2$^+$	3	
377.3+x$^\#$ 6	13/2$^-$	6	
509.3+x$^@$ 5	13/2$^+$	5	
533.9+x‡ 7	19/2$^-$	8	
583.1+x$^\#$ 9	17/2$^-$	8	
677.7+x$^\&$ 6	15/2$^+$	7	
702.8+x^a 7	3/2$^-$,(17/2$^+$)	0+(7)	
727.1+x^a 9	(1/2$^-$)	(2)	
755.8+x^a 6	(7/2$^-$)	2	
776.8+x 7			
780.7+x‡ 8	(23/2$^-$)	(10)	
800.5+x^a 6	(5/2$^-$)	2	
830.5+x^b 6	3/2$^-$	0	
846.6+x^b 9	(1/2$^-$)	2	
865.0+x^b 7	(7/2$^-$)	2	
891.2+x^b 8	(5/2$^-$)	(2)	
930.5+x^b 10	(11/2$^-$)	4	
966.4+x 10	3/2$^-$	0	
979.6+x 9	3/2$^-$	0	
994.3+x 9	3/2$^-$	0	
1012.6+x 15		(2)	
1022.0+x 10		2	
1056.9+x 10		2	
1063.9+x 13		2	
1073.4+x 10		2	

^{231}Pa(p,t)   **1994Le22** (continued)

^{229}Pa Levels (continued)

E(level)	$J^{\pi\dagger}$	L	E(level)	$J^{\pi\dagger}$	L	E(level)	$J^{\pi\dagger}$	L
1104.8+x *10*	$(3/2^-)$	(0)	1302.2+x *12*		(4)	1636.4+x^d *13*	$3/2^+$	3
1121.3+x *11*		(2)	1359.0+x *10*	$3/2^-$	0	1653.0+x *13*		
1134.3+x *12*		(2)	1400.9+x *11*	$3/2^-$	0	1666.7+x^c *14*	$(11/2^-)$	4
1149.7+x *11*		2	1427.0+x *11*	$(3/2^-)$	(0)	1686.2+x^d *14*	$(9/2^+)$	(3)
1161.0+x *10*		2	1457.2+x *12*	$(3/2^-)$	(0)	1708.9+x^c *14*	$(9/2^-)$	(4)
1173.9+x *12*		(2)	1479.3+x *12*			1731.3+x *14*		
1184.5+x *12*		(2)	1510.2+x *13*	$3/2^-$	0	1742.1+x *14*		
1199.8+x *11*		2	1523.7+x^c *13*	$3/2^-$	0	1756.7+x *14*		
1208.5+x *11*		2	1540.0+x^c *14*	$1/2^-$	2	1773.2+x *14*		
1229.2+x *11*		(4)	1569.8+x^c *13*	$7/2^-$	2	1832.6+x *15*		
1252.7+x *11*		(2)	1592.7+x^d *13*	$5/2^-,1/2^+$	2+1			
1286.9+x *12*		(4)	1616.8+x^d *13*	$5/2^+$	3			

† From L, σ(p,t), band assignment.
‡ Band(A): K^π=1/2$^-$, s=$-$i band. Main configuration=1/2[530].
$^\#$ Band(B): K^π=1/2$^-$, s=+i band. Main configuration=1/2[530].
$^@$ Band(C): K^π=1/2$^+$, s=$-$i band. Main configuration=1/2[660].
$^\&$ Band(D): K^π=1/2$^+$, s=+i band. Main configuration=1/2[660].
^{a} Band(E): K^π=1/2$^-$ ^{228}Th core-excited rotational band.
^{b} Band(F): K^π=1/2$^-$ ^{228}Th core-excited rotational band.
^{c} Band(G): K^π=1/2$^-$ ^{228}Th core-excited rotational band.
^{d} Band(H): K^π=1/2$^+$ ^{228}Th core-excited rotational band.
^{e} Band(I): 5/2[642].

${}^{231}\text{Pa}(p,t)$ 1994Le22

**Band(E): $K^\pi = 1/2^-$ ${}^{228}\text{Th}$
core-excited rotational band**

(5/2⁻)   800.5+x

**Band(A): $K^\pi = 1/2^-$,
s=−i band**

(7/2⁻)   755.8+x

(23/2⁻)   780.7+x

(1/2⁻)   727.1+x

Band(C): $K^\pi = 1/2^+$, s=−i band   **Band(D): $K^\pi = 1/2^+$,
s=+i band**   3/2⁻,(17/2⁺)   702.8+x

3/2⁻,(17/2⁺)   702.8+x

15/2⁺   677.7+x

**Band(B): $K^\pi = 1/2^-$,
s=+i band**

17/2⁻   583.1+x

19/2⁻   533.9+x

13/2⁺   509.3+x

13/2⁻   377.3+x   9/2⁺   365.1+x

15/2⁻   326.3+x

3/2⁺   291.4+x

5/2⁺   272.5+x

1/2⁺   240.3+x

9/2⁻   208.3+x

11/2⁻   166.1+x

5/2⁻   87.7+x

7/2⁻   56.1+x

1/2⁻   15.1+x

3/2⁻   x

${}^{229}_{91}\text{Pa}_{138}$

^{231}Pa(p,t)   1994Le22 (continued)

Band(G): K$^\pi$=1/2$^-$
^{228}Th core-excited rotational band

(9/2$^-$)   1708.9+x   **Band(H): K$^\pi$=1/2$^+$**
                                     ^{228}Th core-excited rotational band

                                     (9/2$^+$)   1686.2+x

(11/2$^-$)   1666.7+x

                                     3/2$^+$ 1636.4+x

                                     5/2$^+$ 1616.8+x

5/2$^-$,1/2$^+$ 1592.7+x   5/2$^-$,1/2$^+$ 1592.7+x

7/2$^-$ 1569.8+x

1/2$^-$ 1540.0+x

Band(F): K$^\pi$=1/2$^-$ 3/2$^-$ 1523.7+x
^{228}Th core-excited rotational band

(11/2$^-$)   930.5+x

(5/2$^-$)   891.2+x

(7/2$^-$)   865.0+x

(1/2$^-$)   846.6+x

3/2$^-$ 830.5+x

                                                      Band(I): 5/2[642]

                                                      5/2$^+$ 0

$^{229}_{91}$Pa$_{138}$