

$^{124}\text{Sn}(^{37}\text{Cl},\alpha 4n\gamma)$ 2015Ha16

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 170, 1 (2020)	16-Aug-2020

Data set based on the XUNDL compilations of 2015Ha16 done by B. Singh (McMaster).

2015Ha16: $E(^{37}\text{Cl})=180$ MeV from ATLAS-ANL facility. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$ -coin using Gammasphere array with 100 HPGe detectors. The $\alpha 4n$ reaction populating ^{153}Gd was weak, thus no angular correlation data were obtained. Deduced high-spin levels, J, π , bands, alignments. Comparison with systematics of band termination in neighboring nuclei and search for this effect in ^{153}Tb .

 ^{153}Tb Levels

E(level) [†]	J $\pi^{\ddagger}$	T _{1/2}	Comments
163.2 [#]	11/2 ⁻	186 μs 4	%IT=100 T _{1/2} : from Adopted Levels.
263.2 [@]	9/2 ⁻		
511.1 [#]	15/2 ⁻		
535.2 [@]	13/2 ⁻		
966.3 [@]	17/2 ⁻		
978.1 [#]	19/2 ⁻		
1475.0	19/2 ⁽⁻⁾		
1494.5 [@]	21/2 ⁻		
1533.1 [#]	23/2 ⁻		
2020.8	21/2 ⁽⁺⁾		
2092.7	19/2 ⁽⁺⁾		
2095.0 [@]	25/2 ⁻		
2155.7 [#]	27/2 ⁻		
2619.3 ^{&}	23/2 ⁽⁺⁾		
2707.7 ^a	25/2 ⁽⁺⁾		
2740.4 [@]	29/2 ⁻		
2827.6 [#]	31/2 ⁻		
2832.9 ^{&}	27/2 ⁽⁺⁾		
2992.8 ^a	29/2 ⁽⁺⁾		
3188.9 ^{&}	31/2 ⁽⁺⁾		
3320.5 [@]	33/2 ⁻		
3416.9 ^a	33/2 ⁽⁺⁾		
3489.5 ^b			
3494.6 [#]	35/2 ⁻		
3674.9 ^{&}	35/2 ⁽⁺⁾		
3806.5 [@]	37/2 ⁻		
3960.9 ^a	37/2 ⁽⁺⁾		
4083.6 [#]	39/2 ⁻		
4177.5 ^b			
4270.9 ^{&}	39/2 ⁽⁺⁾		
4372.5 [@]	41/2 ⁻		
4604.9 ^a	41/2 ⁽⁺⁾		
4695.6 [#]	43/2 ⁻		
4945.5 ^b			
4958.9 ^{&}	43/2 ⁽⁺⁾		
5023.5 [@]	45/2 ⁻		

Continued on next page (footnotes at end of table)

$^{124}\text{Sn}(^{37}\text{Cl}, \alpha 4n\gamma)$ **2015Ha16 (continued)** ^{153}Tb Levels (continued)

E(level) [†]	J ^π [‡]	E(level) [†]	J ^π [‡]	E(level) [†]	J ^π [‡]	E(level) [†]	J ^π [‡]
5333.9 ^a	(45/2 ⁺)	6555 ^{&}	(51/2 ⁺)	7880 ^a	(57/2 ⁺)	9735? ^b	
5375.7 [#]	47/2 ⁻	6566.0 [@]	(53/2 ⁻)	7977? ^b		9741 [#]	(67/2 ⁻)
5724.9 ^{&}	(47/2 ⁺)	6945.9 [#]	(55/2 ⁻)	8347 ^{&}	(59/2 ⁺)	10462 [@]	(69/2 ⁻)
5736.6? ^b		6989 ^a	(53/2 ⁺)	8393 [@]	(61/2 ⁻)	10745? ^b	
5757.0 [@]	(49/2 ⁻)	7219? ^b		8759 [#]	(63/2 ⁻)	10766 [#]	(71/2 ⁻)
6127.9 [#]	(51/2 ⁻)	7433 ^{&}	(55/2 ⁺)	8791 ^a	(61/2 ⁺)	11579 [@]	(73/2 ⁻)
6133 ^a	(49/2 ⁺)	7446.0 [@]	(57/2 ⁻)	8814? ^b		11771 [#]	(75/2 ⁻)
6515.6? ^b		7825 [#]	(59/2 ⁻)	9401 [@]	(65/2 ⁻)	12718? [@]	(77/2 ⁻)

[†] From least-squares fit to $E\gamma$ data, assuming 1 keV uncertainty for each γ ray.

[‡] As assigned by 2015Ha16, based on assumed E2 intraband transitions in normal rotational bands.

[#] Band(A): $\pi h_{11/2}$ band, $\alpha = -1/2$. Backbend at $\hbar\omega \approx 0.3$ MeV due to $\nu i_{13/2}^2$ or AB alignment. No evidence for band termination at the highest spin observed here, thus collective behavior persists.

[@] Band(a): $\pi h_{11/2}$ band, $\alpha = +1/2$. Backbend at $\hbar\omega \approx 0.3$ MeV due to $\nu i_{13/2}^2$ or AB alignment. No evidence for band termination at the highest spin observed here, thus collective behavior persists.

[&] Band(B): $\pi h_{11/2} \otimes \nu(i_{13/2}, h_{11/2})$, $\alpha = -1/2$. Possible backbend at ≈ 0.4 MeV due to $\nu i_{13/2}^2$ or BC alignment.

^a Band(b): $\pi h_{11/2} \otimes \nu(i_{13/2}, h_{11/2})$, $\alpha = +1/2$. Possible backbend at ≈ 0.4 MeV due to $\nu i_{13/2}^2$ or BC alignment.

^b Band(C): Decoupled band. Absolute level energies are uncertain since a single connecting transition is tentatively placed.

 $\gamma(^{153}\text{Tb})$

E_γ	$E_i(\text{level})$	J_i^π	E_f	J_f^π	E_γ	$E_i(\text{level})$	J_i^π	E_f	J_f^π
100	263.2	9/2 ⁻	163.2	11/2 ⁻	486	3674.9	35/2 ⁽⁺⁾	3188.9	31/2 ⁽⁺⁾
124	2832.9	27/2 ⁽⁺⁾	2707.7	25/2 ⁽⁺⁾	486	3806.5	37/2 ⁻	3320.5	33/2 ⁻
161	2992.8	29/2 ⁽⁺⁾	2832.9	27/2 ⁽⁺⁾	493	3320.5	33/2 ⁻	2827.6	31/2 ⁻
174	3494.6	35/2 ⁻	3320.5	33/2 ⁻	516	1494.5	21/2 ⁻	978.1	19/2 ⁻
196	3188.9	31/2 ⁽⁺⁾	2992.8	29/2 ⁽⁺⁾	528	1494.5	21/2 ⁻	966.3	17/2 ⁻
216	2832.9	27/2 ⁽⁺⁾	2619.3	23/2 ⁽⁺⁾	529	2619.3	23/2 ⁽⁺⁾	2092.7	19/2 ⁽⁺⁾
228	3416.9	33/2 ⁽⁺⁾	3188.9	31/2 ⁽⁺⁾	544	3960.9	37/2 ⁽⁺⁾	3416.9	33/2 ⁽⁺⁾
258	3674.9	35/2 ⁽⁺⁾	3416.9	33/2 ⁽⁺⁾	545	2020.8	21/2 ⁽⁺⁾	1475.0	19/2 ⁽⁻⁾
272	535.2	13/2 ⁻	263.2	9/2 ⁻	554	1533.1	23/2 ⁻	978.1	19/2 ⁻
277	4083.6	39/2 ⁻	3806.5	37/2 ⁻	562	2095.0	25/2 ⁻	1533.1	23/2 ⁻
284	2992.8	29/2 ⁽⁺⁾	2707.7	25/2 ⁽⁺⁾	566	4372.5	41/2 ⁻	3806.5	37/2 ⁻
289	4372.5	41/2 ⁻	4083.6	39/2 ⁻	580	3320.5	33/2 ⁻	2740.4	29/2 ⁻
312	3806.5	37/2 ⁻	3494.6	35/2 ⁻	585	2740.4	29/2 ⁻	2155.7	27/2 ⁻
323	4695.6	43/2 ⁻	4372.5	41/2 ⁻	589	4083.6	39/2 ⁻	3494.6	35/2 ⁻
328	5023.5	45/2 ⁻	4695.6	43/2 ⁻	596	4270.9	39/2 ⁽⁺⁾	3674.9	35/2 ⁽⁺⁾
348	511.1	15/2 ⁻	163.2	11/2 ⁻	600	2095.0	25/2 ⁻	1494.5	21/2 ⁻
352	5375.7	47/2 ⁻	5023.5	45/2 ⁻	612	4695.6	43/2 ⁻	4083.6	39/2 ⁻
356	3188.9	31/2 ⁽⁺⁾	2832.9	27/2 ⁽⁺⁾	623	2155.7	27/2 ⁻	1533.1	23/2 ⁻
371	6127.9	(51/2 ⁻)	5757.0	(49/2 ⁻)	644	4604.9	41/2 ⁽⁺⁾	3960.9	37/2 ⁽⁺⁾
372	535.2	13/2 ⁻	163.2	11/2 ⁻	645	2740.4	29/2 ⁻	2095.0	25/2 ⁻
381	5757.0	(49/2 ⁻)	5375.7	47/2 ⁻	651	5023.5	45/2 ⁻	4372.5	41/2 ⁻
424	3416.9	33/2 ⁽⁺⁾	2992.8	29/2 ⁽⁺⁾	667	3494.6	35/2 ⁻	2827.6	31/2 ⁻
431	966.3	17/2 ⁻	535.2	13/2 ⁻	672	2827.6	31/2 ⁻	2155.7	27/2 ⁻
438 [†]	6566.0	(53/2 ⁻)	6127.9	(51/2 ⁻)	680	5375.7	47/2 ⁻	4695.6	43/2 ⁻
455	966.3	17/2 ⁻	511.1	15/2 ⁻	686	2707.7	25/2 ⁽⁺⁾	2020.8	21/2 ⁽⁺⁾
468	978.1	19/2 ⁻	511.1	15/2 ⁻	688	4177.5?		3489.5?	

Continued on next page (footnotes at end of table)

$^{124}\text{Sn}(^{37}\text{Cl},\alpha 4n\gamma)$ **2015Ha16 (continued)** $\gamma(^{153}\text{Tb})$ (continued)

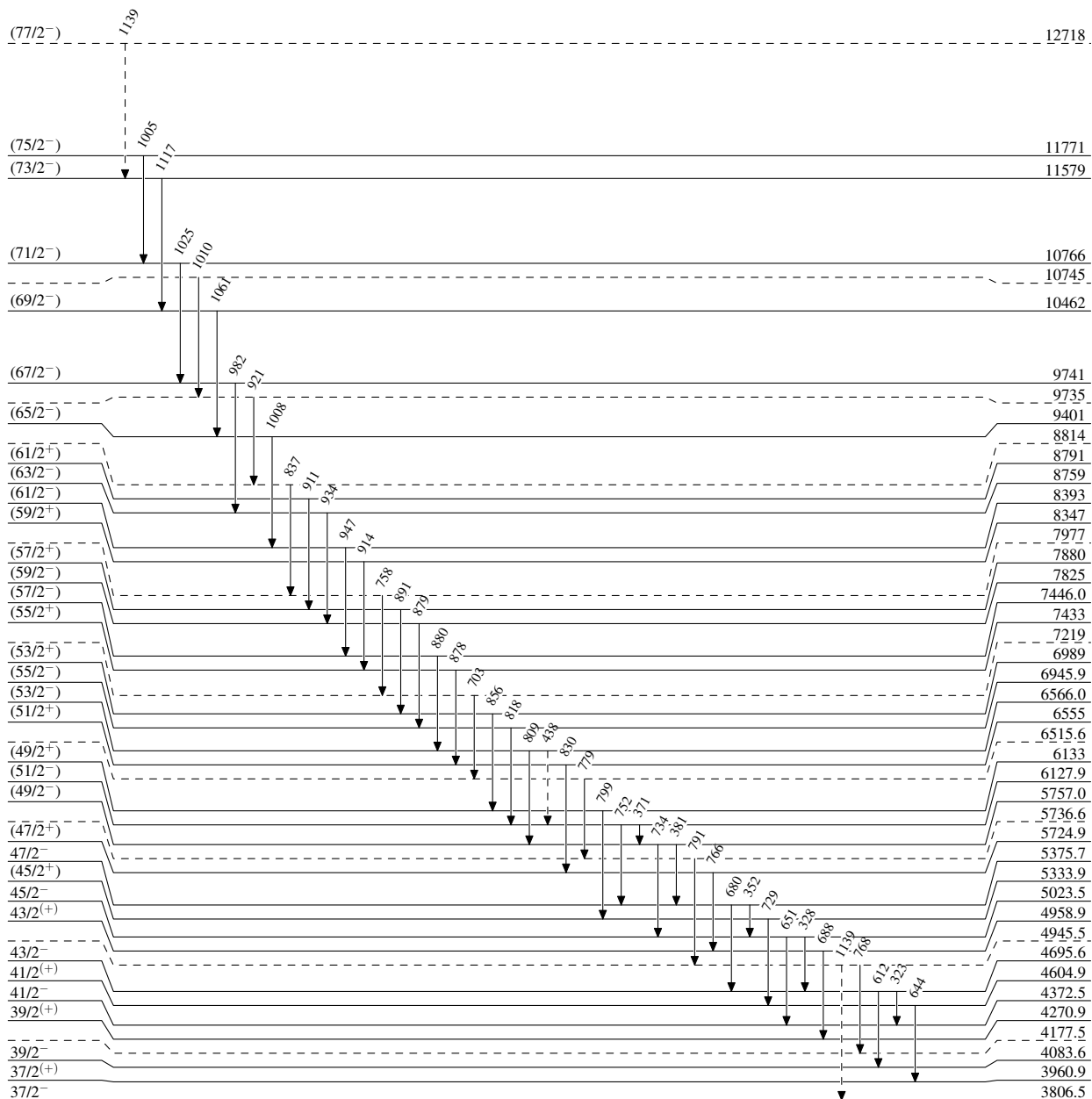
E_γ	$E_i(\text{level})$	J^π_i	E_f	J^π_f	E_γ	$E_i(\text{level})$	J^π_i	E_f	J^π_f
688	4958.9	43/2 ⁽⁺⁾	4270.9	39/2 ⁽⁺⁾	891	7880	(57/2 ⁺)	6989	(53/2 ⁺)
703	7219?		6515.6?		911	8791	(61/2 ⁺)	7880	(57/2 ⁺)
729	5333.9	(45/2 ⁺)	4604.9	41/2 ⁽⁺⁾	914	8347	(59/2 ⁺)	7433	(55/2 ⁺)
734	5757.0	(49/2 ⁻)	5023.5	45/2 ⁻	921	9735?		8814?	
752	6127.9	(51/2 ⁻)	5375.7	47/2 ⁻	934	8759	(63/2 ⁻)	7825	(59/2 ⁻)
758	7977?		7219?		947	8393	(61/2 ⁻)	7446.0	(57/2 ⁻)
766	5724.9	(47/2 ⁺)	4958.9	43/2 ⁽⁺⁾	963	1475.0	19/2 ⁽⁻⁾	511.1	15/2 ⁻
768	4945.5?		4177.5?		982	9741	(67/2 ⁻)	8759	(63/2 ⁻)
779	6515.6?		5736.6?		1005	11771	(75/2 ⁻)	10766	(71/2 ⁻)
791	5736.6?		4945.5?		1008	9401	(65/2 ⁻)	8393	(61/2 ⁻)
799	6133	(49/2 ⁺)	5333.9	(45/2 ⁺)	1010	10745?		9735?	
809	6566.0	(53/2 ⁻)	5757.0	(49/2 ⁻)	1025	10766	(71/2 ⁻)	9741	(67/2 ⁻)
818	6945.9	(55/2 ⁻)	6127.9	(51/2 ⁻)	1061	10462	(69/2 ⁻)	9401	(65/2 ⁻)
830	6555	(51/2 ⁺)	5724.9	(47/2 ⁺)	1117	2092.7	19/2 ⁽⁺⁾	978.1	19/2 ⁻
837	8814?		7977?		1117	11579	(73/2 ⁻)	10462	(69/2 ⁻)
856	6989	(53/2 ⁺)	6133	(49/2 ⁺)	1139 [†]	4945.5?		3806.5	37/2 ⁻
878	7433	(55/2 ⁺)	6555	(51/2 ⁺)	1139 [†]	12718?	(77/2 ⁻)	11579	(73/2 ⁻)
879	7825	(59/2 ⁻)	6945.9	(55/2 ⁻)	1173	2707.7	25/2 ⁽⁺⁾	1533.1	23/2 ⁻
880	7446.0	(57/2 ⁻)	6566.0	(53/2 ⁻)					

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

$^{124}\text{Sn}(^{37}\text{Cl}, \alpha 4n\gamma)$ 2015Ha16

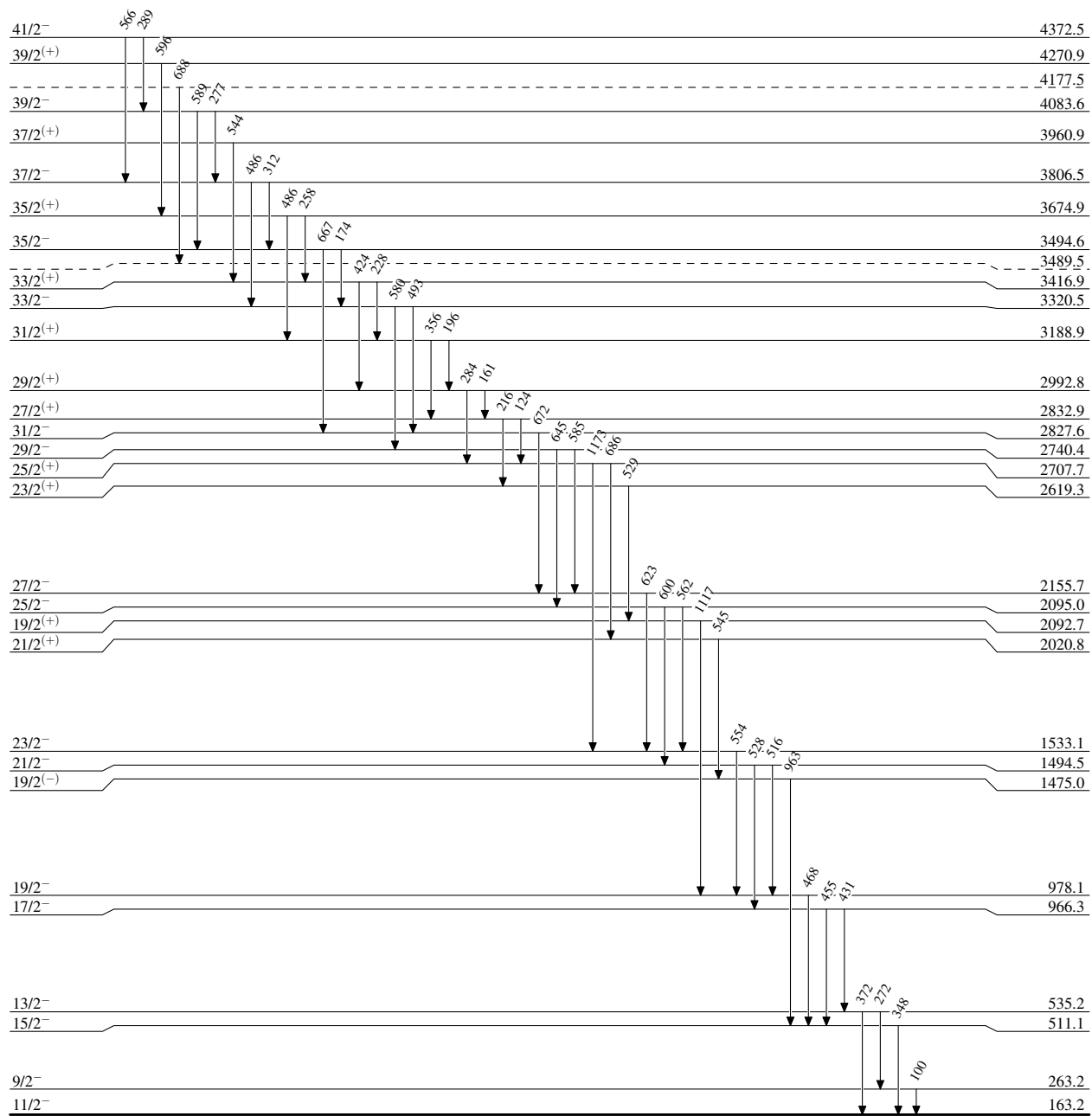
Legend

Level Scheme

-----► γ Decay (Uncertain) $^{153}_{65}\text{Tb}_{88}$

$^{124}\text{Sn}(^{37}\text{Cl}, \alpha 4n\gamma)$ 2015Ha16

Level Scheme (continued)

 $^{153}_{65}\text{Tb}_{88}$ 186 μs

Band(A): $\pi h_{11/2}$ band, $\alpha=-1/2$

Spin-Parity	Energy (keV)
$(75/2^-)$	11771
$(71/2^-)$	10766
$(67/2^-)$	9741
$(63/2^-)$	8759
$(59/2^-)$	7825
$(55/2^-)$	6945.9
$(51/2^-)$	6127.9
$47/2^-$	5375.7
$43/2^-$	4695.6
$39/2^-$	4083.6
$35/2^-$	3494.6
$31/2^-$	2827.6
$27/2^-$	2155.7
$23/2^-$	1533.1
$19/2^-$	978.1
$15/2^-$	511.1
$11/2^-$	163.2

Band(a): $\pi h_{11/2}$ band, $\alpha=+1/2$

Spin-Parity	Energy (keV)
$(77/2^-)$	12718
$(73/2^-)$	11579
$(69/2^-)$	10462
$(65/2^-)$	9401
$(61/2^-)$	8393
$(57/2^-)$	7446.0
$(53/2^-)$	6566.0
$(49/2^-)$	5757.0
$45/2^-$	5023.5
$41/2^-$	4372.5
$37/2^-$	3806.5
$33/2^-$	3320.5
$29/2^-$	2740.4
$25/2^-$	2095.0
$21/2^-$	1494.5
$17/2^-$	966.3
$13/2^-$	535.2
$9/2^-$	263.2

Band(B): $\pi h_{11/2} \otimes v(i_{13/2})$, $\alpha=-1/2$

Spin-Parity	Energy (keV)
$(59/2^+)$	8347
$(55/2^+)$	7433
$(51/2^+)$	6555
$(47/2^+)$	5724.9
$43/2^{(+)}$	4958.9
$39/2^{(+)}$	4270.9
$35/2^{(+)}$	3674.9
$31/2^{(+)}$	3188.9
$27/2^{(+)}$	2832.9
$23/2^{(+)}$	2619.3

Band(b): $\pi h_{11/2} \otimes v(i_{13/2})$, $\alpha=+1/2$

Spin-Parity	Energy (keV)
$(61/2^+)$	8791
$(57/2^+)$	7880
$(53/2^+)$	6989
$(49/2^+)$	6133
$(45/2^+)$	5333.9
$41/2^{(+)}$	4604.9
$37/2^{(+)}$	3960.9
$33/2^{(+)}$	3416.9
$29/2^{(+)}$	2992.8
$25/2^{(+)}$	2707.7

Band(C): Decoupled band

Spin-Parity	Energy (keV)
$(77/2^-)$	12718
$(73/2^-)$	11579
$(69/2^-)$	10462
$(65/2^-)$	9401
$(61/2^-)$	8393
$(57/2^-)$	7446.0
$(53/2^-)$	6566.0
$(49/2^-)$	5757.0
$45/2^-$	5023.5
$41/2^-$	4372.5
$37/2^-$	3806.5
$33/2^-$	3320.5
$29/2^-$	2740.4
$25/2^-$	2095.0
$21/2^-$	1494.5
$17/2^-$	966.3
$13/2^-$	535.2
$9/2^-$	263.2