

²⁵²Cf SF decay 2001Hw01,1998Hw08

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	D. De Frenne	NDS 110, 1745 (2009)	31-Dec-2008

Parent: ²⁵²Cf: E=0; J^π=0⁺; T_{1/2}=2.645 y 8; %SF decay=3.092 8
²⁵²Cf-%SF decay: %SF=3.092 8 (from 'Adopted Levels' for ²⁵²Cf in ENSDF database).
 Measured γ, γγγ using GAMMASPHERE array of 72 Ge detectors.

¹⁰²Nb Levels

E(level) [†]	J ^π [‡]	Comments
0.0+y [@]	(1 ⁺)	E(level): This level is considered by 1998Hw08 as the ground state of ¹⁰² Nb but is very probably the isomeric state following 2007Ri01. The energy of the isomer would be then 93 23 keV.
64.5+y [@]	(2 ⁺)	
161.9+y [@]	(3 ⁺)	
287.4+y [@]	(4 ⁺)	
453.1+y [@]	(5 ⁺)	
632.5+y [#]	(6 ⁺)	
871.1+y [#]	(7 ⁺)	
1099.6+y [#]	(8 ⁺)	
1406.9+y [#]	(9 ⁺)	
1677.5+y [#]	(10 ⁺)	
x ^{&}	(3 ⁻)	E(level): This level with unknown excitation energy is considered as the lowest energy level to which two ΔJ=1 bands finally decay following 2001Hw01.
162.8+x ^a	(4 ⁻)	
356.2+x ^{&}	(5 ⁻)	
440.8+x ^b	(2 ⁻)	
545.0+x ^c	(3 ⁻)	
580.6+x ^a	(6 ⁻)	
677.2+x ^b	(4 ⁻)	
833.0+x ^{&}	(7 ⁻)	
852.0+x ^c	(5 ⁻)	
1045.1+x ^b	(6 ⁻)	
1116.9+x ^a	(8 ⁻)	
1284.2+x ^c	(7 ⁻)	
1421.7+x ^{&}	(9 ⁻)	
1586.0+x ^b	(8 ⁻)	
1758.2+x ^a	(10 ⁻)	
1854.2+x ^c	(9 ⁻)	
2286.4+x ^b	(10 ⁻)	

[†] Levels of the different parts of the level scheme calculated with a least-squares procedure using the observed gammas.

[‡] From observed band structure and systematics (2001Hw01). Supersedes the J^π's of (1998Hw08) for K^π=3⁻ and K^π=2⁻ band members which were much higher. But the suggested spins are very doubtful. The consequence of the fact that the high spin level would be the ground state and not the low spin is that the spin assignments proposed here become very uncertain as they still consider the low spin isomer as the ground state. (see also Adopted Levels Gammas) All other proposed spins for excited states are based on that assumption. Probably what they consider as a 120 keV level could be the ground state. New experiments to clarify that situation are highly recommended by the evaluator. In the meantime the spins of the levels and the partial level schemes should be considered as very preliminary.

Band(A): ΔJ=1 Band based on (6⁺).

^{252}Cf SF decay 2001Hw01,1998Hw08 (continued) ^{102}Nb Levels (continued)

@ Band(B): $K^\pi=1^+$, $\pi 5/2[422]v3/2[411]$.

& Band(C): $K^\pi=(3^-)$, $\pi 1/2[431]v5/2[532]$ band, $\alpha=1$. Semi-decoupled band.

a Band(c): $K^\pi=3^-$, $\pi 1/2[431]v5/2[532]$ band, $\alpha=0$.

b Band(D): $K^\pi=2^-$, $\pi 1/2[431]v5/2[532]$ band, $\alpha=0$. Semi-decoupled band.

c Band(d): $K^\pi=2^-$, $\pi 1/2[431]v5/2[532]$ band, $\alpha=1$.

 $\gamma(^{102}\text{Nb})$

E_γ^\dagger	I_γ	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult. ‡
x		x	(3 ⁻)			
64.5		64.5+y	(2 ⁺)	0.0+y	(1 ⁺)	(M1)
96.6 [#]		677.2+x	(4 ⁻)	580.6+x	(6 ⁻)	
97.4		161.9+y	(3 ⁺)	64.5+y	(2 ⁺)	(M1)
104.2	30	545.0+x	(3 ⁻)	440.8+x	(2 ⁻)	
125.5	60	287.4+y	(4 ⁺)	161.9+y	(3 ⁺)	
132.2	39	677.2+x	(4 ⁻)	545.0+x	(3 ⁻)	
162.8	100	162.8+x	(4 ⁻)	x	(3 ⁻)	
165.7	32	453.1+y	(5 ⁺)	287.4+y	(4 ⁺)	
174.8	26	852.0+x	(5 ⁻)	677.2+x	(4 ⁻)	
179.4	17	632.5+y	(6 ⁺)	453.1+y	(5 ⁺)	
188.8	11	545.0+x	(3 ⁻)	356.2+x	(5 ⁻)	
193.1	11	1045.1+x	(6 ⁻)	852.0+x	(5 ⁻)	
193.4	33	356.2+x	(5 ⁻)	162.8+x	(4 ⁻)	
212.1 [#]		1045.1+x	(6 ⁻)	833.0+x	(7 ⁻)	
222.9	10	287.4+y	(4 ⁺)	64.5+y	(2 ⁺)	
224.4	20	580.6+x	(6 ⁻)	356.2+x	(5 ⁻)	
228.5	3.9	1099.6+y	(8 ⁺)	871.1+y	(7 ⁺)	
236.4	3.6	677.2+x	(4 ⁻)	440.8+x	(2 ⁻)	
238.6	7.7	871.1+y	(7 ⁺)	632.5+y	(6 ⁺)	
239.1	8.6	1284.2+x	(7 ⁻)	1045.1+x	(6 ⁻)	
252.4	12	833.0+x	(7 ⁻)	580.6+x	(6 ⁻)	
268.2	2.8	1854.2+x	(9 ⁻)	1586.0+x	(8 ⁻)	
270.6	1.6	1677.5+y	(10 ⁺)	1406.9+y	(9 ⁺)	
278.0	15	440.8+x	(2 ⁻)	162.8+x	(4 ⁻)	
283.9	7.1	1116.9+x	(8 ⁻)	833.0+x	(7 ⁻)	
291.2	0.5	453.1+y	(5 ⁺)	161.9+y	(3 ⁺)	
301.8	3.0	1586.0+x	(8 ⁻)	1284.2+x	(7 ⁻)	
304.8	3.0	1421.7+x	(9 ⁻)	1116.9+x	(8 ⁻)	
307.0	3.3	852.0+x	(5 ⁻)	545.0+x	(3 ⁻)	
307.3	1.8	1406.9+y	(9 ⁺)	1099.6+y	(8 ⁺)	
336.5 [#]		1758.2+x	(10 ⁻)	1421.7+x	(9 ⁻)	
345.1	1.0	632.5+y	(6 ⁺)	287.4+y	(4 ⁺)	
356.2	9.2	356.2+x	(5 ⁻)	x	(3 ⁻)	
367.9	6.4	1045.1+x	(6 ⁻)	677.2+x	(4 ⁻)	
382.2	15	545.0+x	(3 ⁻)	162.8+x	(4 ⁻)	
417.8	10	580.6+x	(6 ⁻)	162.8+x	(4 ⁻)	
418.0	1.5	871.1+y	(7 ⁺)	453.1+y	(5 ⁺)	
432.2	2.6	1284.2+x	(7 ⁻)	852.0+x	(5 ⁻)	
432.2	1.5	2286.4+x	(10 ⁻)	1854.2+x	(9 ⁻)	
440.8	20	440.8+x	(2 ⁻)	x	(3 ⁻)	
467.1	1.0	1099.6+y	(8 ⁺)	632.5+y	(6 ⁺)	
476.8	5.0	833.0+x	(7 ⁻)	356.2+x	(5 ⁻)	
535.8	0.5	1406.9+y	(9 ⁺)	871.1+y	(7 ⁺)	
536.3	5.1	1116.9+x	(8 ⁻)	580.6+x	(6 ⁻)	

Continued on next page (footnotes at end of table)

 ^{252}Cf SF decay **2001Hw01,1998Hw08** (continued) $\gamma(^{102}\text{Nb})$ (continued)

E_γ †	I_γ	$E_i(\text{level})$	J_i^π	E_f	J_f^π
540.9	1.5	1586.0+x	(8 ⁻)	1045.1+x	(6 ⁻)
570.0	1.3	1854.2+x	(9 ⁻)	1284.2+x	(7 ⁻)
577.9	0.5	1677.5+y	(10 ⁺)	1099.6+y	(8 ⁺)
588.7	3.5	1421.7+x	(9 ⁻)	833.0+x	(7 ⁻)
641.3	1.0	1758.2+x	(10 ⁻)	1116.9+x	(8 ⁻)
700.4	0.7	2286.4+x	(10 ⁻)	1586.0+x	(8 ⁻)

† From [1998Hw08](#).‡ From [1998Hw08](#).

Placement of transition in the level scheme is uncertain.

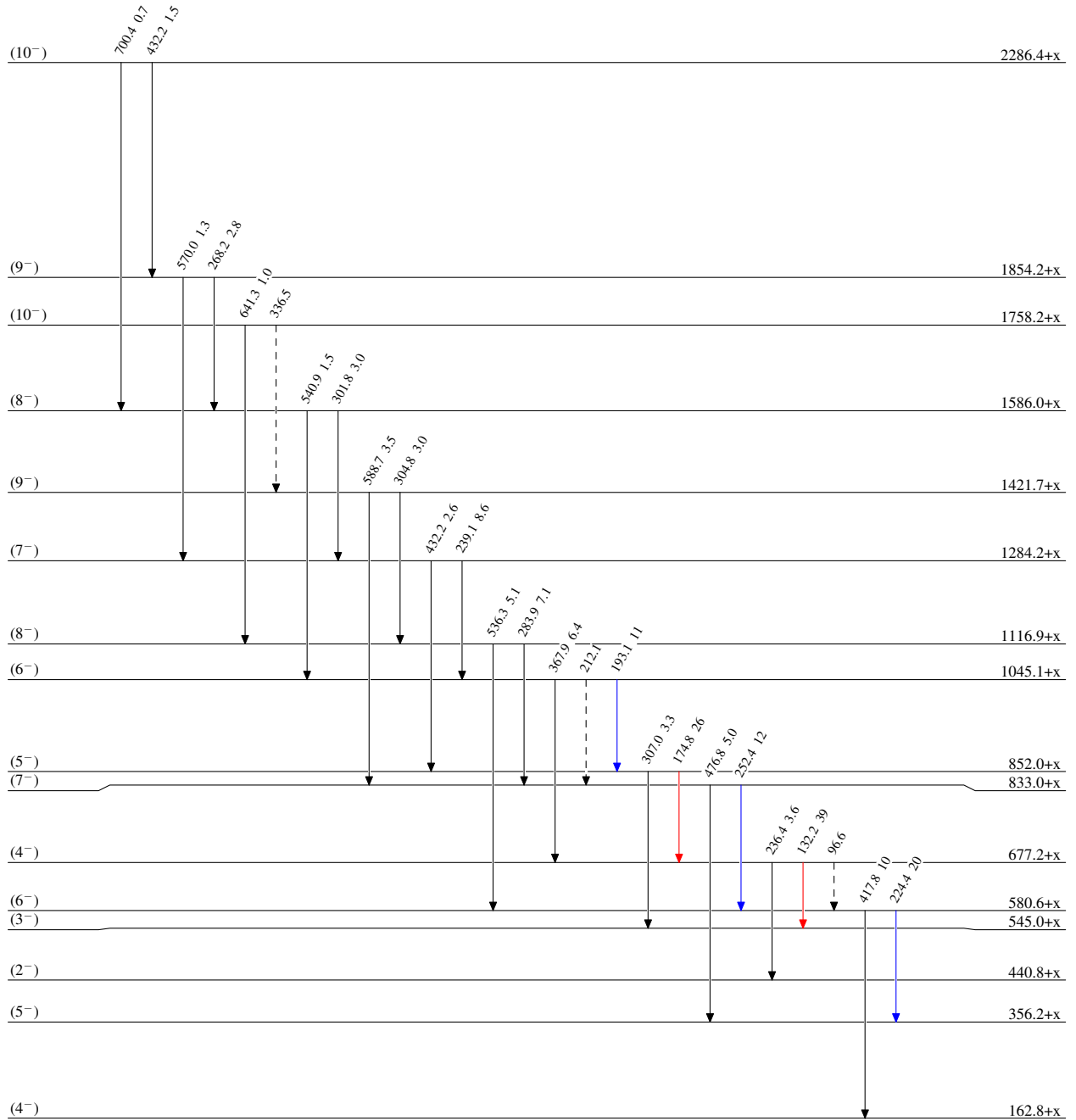
^{252}Cf SF decay 2001Hw01,1998Hw08

Legend

Level Scheme

Intensities: Type not specified

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




 $^{102}_{41}\text{Nb}_{61}$

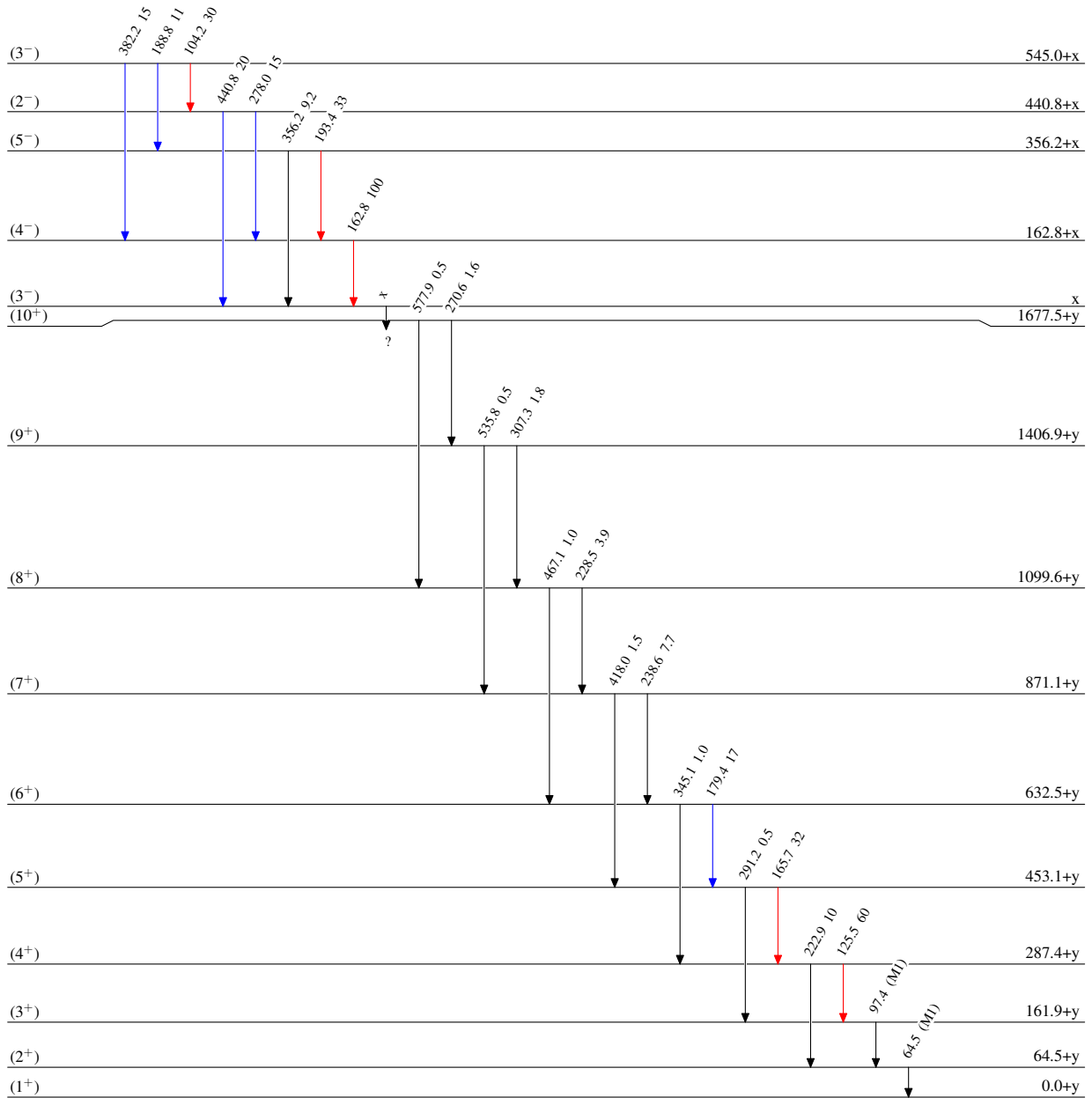
^{252}Cf SF decay 2001Hw01,1998Hw08

Level Scheme (continued)

Intensities: Type not specified

Legend

-  $I_\gamma < 2\% \times I_\gamma^{\text{max}}$
 $I_\gamma < 10\% \times I_\gamma^{\text{max}}$
 $I_\gamma > 10\% \times I_\gamma^{\text{max}}$

 $^{102}_{41}\text{Nb}_{61}$

^{252}Cf SF decay 2001Hw01,1998Hw08

