^{252}Cf SF decay   2010Si17,2009Hw03

	Type	Author	History Citation	Literature Cutoff Date
	Full Evaluation	Coral M. Baglin	NDS 114, 1293 (2013)	1-Sep-2013

Parent: ^{252}Cf: E=0.0; $J^{\pi}=0^{+}$; $T_{1/2}$=2.645 y 8; %SF decay=3.092 8

^{252}Cf-%SF decay: %SF((total): 3.092 8 for ^{252}Cf.

2010Si17 studied ^{248}Cm SF decay also (0^{+} parent with $T_{1/2}$=3.48×10^{5} y 6, $J^{\pi}=0^{+}$ and %SF(total)=8.39). That study was undertaken to measure angular correlations between delayed transitions, but the low yield of ^{91}Rb and the presence of contaminating transitions precluded such measurements for ^{91}Rb.

2010Si17:

^{248}Cm SF decay: source At center of EUROGAM-II array, 300 ns time window; measured Eγ, $\gamma\gamma$ coin; shell-model calculations.

$\quad$^{252}Cf SF decay: source At center of Gammasphere array; 900 ns time window; measured prompt (±10 ns) and delayed (40 ns $21$0 ns) gammas, Eγ, $\gamma\gamma\gamma$ coin, isomer $T_{1/2}$.

2009Hw03: ^{252}Cf source (α decay intensity of 62 μCi) placed between two 13-micron thick Fe foils inside a 7.62 cm polyethylene ball; Gammasphere array (101 Compton-suppressed Ge detectors); measured Eγ (E>33 keV), Iγ, $\gamma\gamma\gamma$ coin, (Pm x ray)-γ coin, Pm-Rb cross coin.

Level scheme supported by coincidence data.

^{91}Rb Levels

E(level)[†]	J^{π}[‡]	$T_{1/2}$	Comments
0.0	$3/2^{(-)}$[#]		
108.7 3	$(5/2^{-})$[#]		
721.6 4	$(7/2^{-})$		
1133.7[&] 4	$(9/2^{+})$	16 ns 1	%IT=100 %IT: only IT decay has been observed. $T_{1/2}$: from $\gamma\gamma$(t) (2010Si17); summed time spectrum double-gated on prompt 707γ, 1138γ, 1119γ and delayed 412γ, 613γ, 1025γ fitted by exponential decay plus constant background. From ^{252}Cf SF decay.
1840.3[&] 5	$(13/2^{+})$		
2849.0[&] 11	[@]		
2901.8[&] 11	[@]		
2978.5[&] 6	$(17/2^{+})$		
3349.4 15			
3573.2 12			
3877.2 16			
4097.1[&] 7	$(21/2^{+})$		J^{π}: consistent with calculated level spectrum in 2010Si17.
4570.7 12			
5297.9 16	$(27/2^{-})$		J^{π}: 27/2^{-} state with dominant configuration of $\pi g_{9/2}\otimes\nu(g_{7/2}h_{11/2})$ is predicted from calculations by 2010Si17.

[†] From least-squares fit to Eγ, assigning 1 keV uncertainty to data for which authors did not state an uncertainty.

[‡] Suggested by authors by analogy with ^{89}Rb, except As noted.

[#] From Adopted Levels.

[@] A 15/2^{+} level from model calculations could correspond to either of the observed 2849 and 2902 levels.

[&] Band(A): π g$_{9/2}$, α=+1/2 band. Member of sequence connected by γ cascade to (9/2^{+}) 1134-keV isomer.

<u>^{252}Cf SF decay   **2010Si17,2009Hw03** (continued)</u>

<u>γ(^{91}Rb)</u>

E_γ†	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α#	Comments
108.7‡ *3*	100‡ *5*	108.7	(5/2⁻)	0.0	3/2⁽⁻⁾			
304.0		3877.2		3573.2				
412.0‡ *3*	22‡ *1*	1133.7	(9/2⁺)	721.6	(7/2⁻)			
473.6		4570.7		4097.1	(21/2⁺)			
500.4		3349.4		2849.0				
594.7		3573.2		2978.5	(17/2⁺)			
612.9‡ *3*	39‡ *2*	721.6	(7/2⁻)	108.7	(5/2⁻)			
706.6‡ *3*	26‡ *1*	1840.3	(13/2⁺)	1133.7	(9/2⁺)			
721.5		721.6	(7/2⁻)	0.0	3/2⁽⁻⁾			
727.2		5297.9	(27/2⁻)	4570.7				
1008.7		2849.0		1840.3	(13/2⁺)			
1024.9‡ *3*	21‡ *1*	1133.7	(9/2⁺)	108.7	(5/2⁻)	[M2]	0.001124 *16*	α=0.001124 *16*; α(K)=0.000995 *14*; α(L)=0.0001084 *16*; α(M)=1.79×10⁻⁵ *3*; α(N+..)=2.12×10⁻⁶ α(N)=2.03×10⁻⁶ *3*; α(O)=8.86×10⁻⁸ *13* I(1025γ):I(412γ)=48 *5*:46 *4* (2010Si17).
1061.5		2901.8		1840.3	(13/2⁺)			
1118.6‡ *3*	2‡ *1*	4097.1	(21/2⁺)	2978.5	(17/2⁺)			
1134.1	2.9 *8*	1133.7	(9/2⁺)	0.0	3/2⁽⁻⁾	[E3]	0.000801 *12*	α=0.000801 *12*; α(K)=0.000708 *10*; α(L)=7.82×10⁻⁵ *11*; α(M)=1.291×10⁻⁵ *18*; α(N+..)=1.80×10⁻⁶ α(N)=1.456×10⁻⁶ *21*; α(O)=6.18×10⁻⁸ *9*; α(IPF)=2.86×10⁻⁷ *4* I_γ: from I(412γ) (2009Hw03) and I(1134γ):I(412γ)=6.0 *15*:46 *4* (2010Si17).
1138.2‡ *3*	8‡ *1*	2978.5	(17/2⁺)	1840.3	(13/2⁺)			

† From fig. 15 of 2010Si17, except As noted. data from 2009Hw03 are In excellent agreement.
‡ From 2009Hw03; uncertainty in Eγ is 0.3 keV, but statistical uncertainty is 0.1 keV according to e-mail reply from the first author of 2009Hw03 to B. Singh on Sept 21, 2009. An uncertainty in Iγ of 5% for Iγ>20, 15% for Iγ=2-20 and 30% for Iγ<2 was assigned based on the statement in the same e-mail that the statistical uncertainty is 1% but the total uncertainty (including systematic) is 5% for strong peaks and up to 30% for very weak lines. In the assignment of the uncertainty, the number of significant digits was kept the same as in figure 5 of 2009Hw03.
# 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.
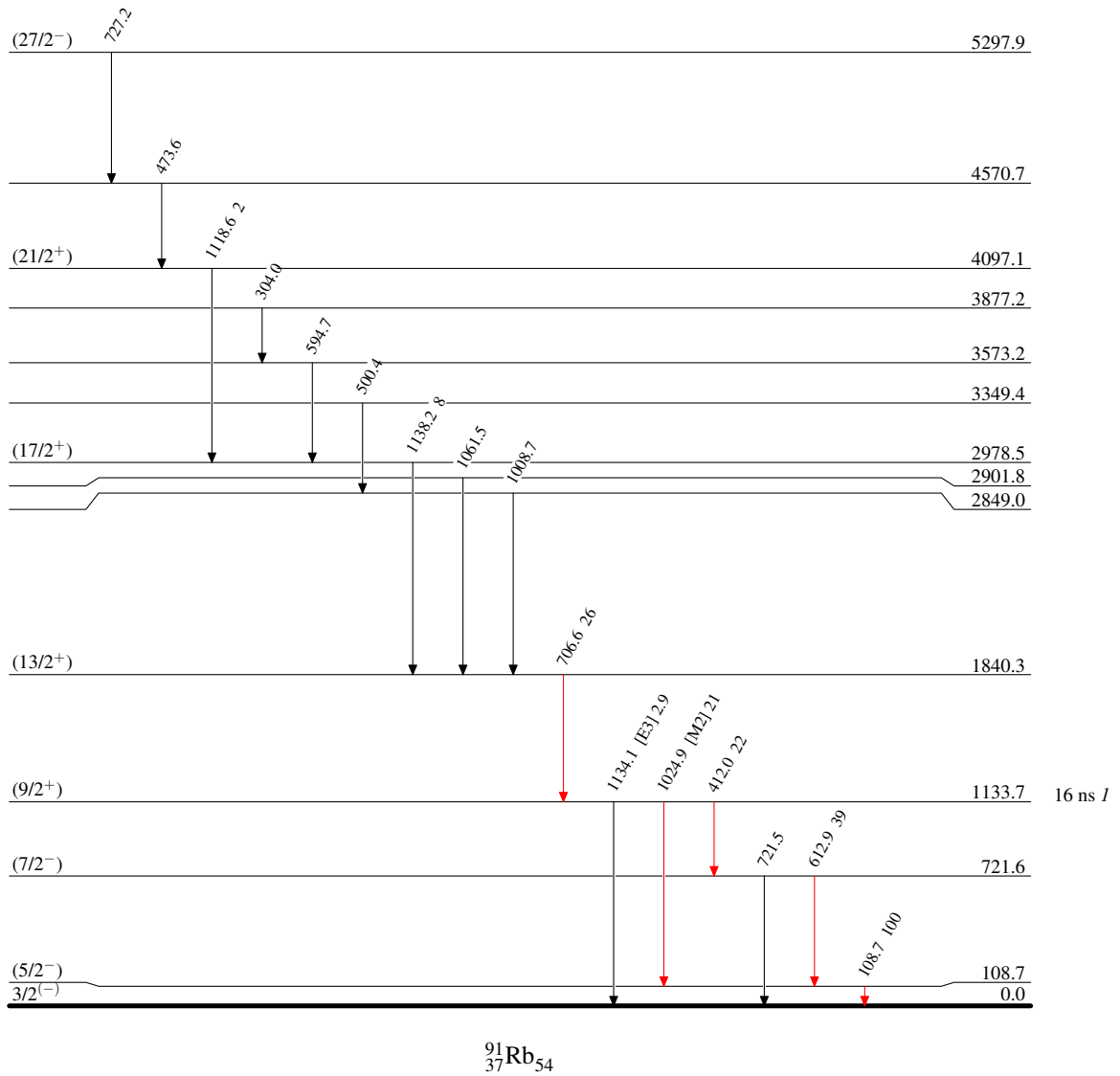
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Level Scheme

Intensities: Relative I$_\gamma$

Legend

I$_\gamma$ < 2%×I$_\gamma^{max}$
I$_\gamma$ < 10%×I$_\gamma^{max}$
I$_\gamma$ > 10%×I$_\gamma^{max}$

${}^{91}_{37}$Rb$_{54}$

^{252}Cf SF decay   2010Si17,2009Hw03

Band(A): π g$_{9/2}$, α=+1/2 band

$(21/2^+)$ 4097.1

1119

$(17/2^+)$ 2978.5

2901.8

2849.0

1138

1009   1062

$(13/2^+)$ 1840.3

707

$(9/2^+)$ 1133.7

${}^{91}_{37}$Rb$_{54}$