^{252}Cf SF decay 2015Wa28

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 185, 2 (2022)	23-Aug-2022

Parent: ^{252}Cf: E=0.0; $J^{\pi}=0^+$; $T_{1/2}$=2.647 y *3*; %SF decay=3.102 *3*

^{252}Cf-$T_{1/2}$: From ^{252}Cf Adopted Levels in the ENSDF database (Jan 2021 update).

^{252}Cf-%SF decay: %SF=3.102 *3* for ^{252}Cf SF decay.

Includes prompt γ-ray study from ^{9}Be(^{238}U,Fγ) reaction from 2015Wa28.

2015Wa28: data from two experiments have been combined: 1. ^{252}Cf SF decay: measured Eγ and $\gamma\gamma$ using GAMMASPHERE array comprised of 101 Compton-suppressed Ge detectors at LBNL facility 2. ^{9}Be(^{238}U,Fγ),E=6.2 MeV/nucleon, measured Eγ, Iγ, Z- and A- gated $\gamma\gamma$ coincidences with isotopically identified fission fragments using VAMOS++ and EXOGAM array at GANIL facility. Deduced high-spin levels.

Others:

2000Hw03 (also 2001Ha14,1998Hw08): measured Eγ and $\gamma\gamma$ using GAMMASPHERE array comprised of 72 Compton-suppressed Ge detectors. Band assigned to ^{149}Pr in 1998Hw08 actually belongs to ^{151}Pr.

Others:

1974ClZX (also 1972ClZN): fission fragment isomers populated before β decay in deexcitation of fission fragments observed through (x-ray)γ and $\gamma\gamma$ coin. Mass assignments, energies and lifetimes measured in 6-parameter experiment with two fission, one Ge(Li) and one Si(Li) detectors.

1970Wa05 (also 1966WaZX from the same group): ce data.

^{149}Pr Levels

E(level)[†]	J^{π}[‡]	$T_{1/2}$	Comments
0.0	(5/2$^+$)		Possible configuration=π5/2[413] from quasiparticle-rotor model calculations (2015Wa28).
58.5[#] *3*	(7/2$^-$)	22.9 ns *18*	$T_{1/2}$: (fragment)(fragment)(x-ray)γ(t) (1974ClZX). Other: 26 ns *4* from $\gamma\gamma$(t) (2010Rz02) in ^{252}Cf SF decay. See also the Adopted Levels, where the $T_{1/2}$ values from ^{149}Ce β^- decay, shorter by a factor of ≈3 from those in SF decays are discussed.
86.5[&] *5*	(7/2$^+$)		
161.7[#] *4*	(11/2$^-$)		
174.9[@] *5*	(9/2$^+$)		
365.0[&] *7*	(11/2$^+$)		
381.5[#] *5*	(15/2$^-$)		
407.3[@] *5*	(13/2$^+$)		
711.8[#] *6*	(19/2$^-$)		
736.6[&] *9*	(15/2$^+$)		
752.0[@] *6*	(17/2$^+$)		
1127.9[#] *6*	(23/2$^-$)		
1174.0[&] *10*	(19/2$^+$)		
1189.3[@] *6*	(21/2$^+$)		
1607.8[#] *7*	(27/2$^-$)		
1664.7[&] *12*	(23/2$^+$)		
1695.6[@] *7*	(25/2$^+$)		
2130.3[#] *9*	(31/2$^-$)		
2192.0[&] *13*	(27/2$^+$)		
2230.8[@] *8*	(29/2$^+$)		
2664.8[#] *10*	(35/2$^-$)		
2722.5[@] *9*	(33/2$^+$)		
3185.1[#] *11*	(39/2$^-$)		
3724.0[#] *12*	(43/2$^-$)		

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^{252}Cf SF decay 2015Wa28 (continued)

^{149}Pr Levels (continued)

† From least-squares fit to Eγ data.
‡ As proposed by 2015Wa28. Note that spins were two units higher in their previous work 2000Hw03, for band based on (7/2⁻).
# Band(A): Band based on (7/2⁻). Possible octupole band. Bands 1 and 2 in Figure 14 of 2015Wa28 possibly form alternating-parity bands.
@ Band(B): Band based on (9/2⁺). Possible octupole band. Bands 1 and 2 in Figure 14 of 2015Wa28 possibly form alternating-parity bands.
& Band(C): Band based on (7/2⁺).

γ(^{149}Pr)

E_γ †	I_γ ‡	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α #	Comments
(13.2)		174.9	(9/2⁺)	161.7	(11/2⁻)			
(25.8)		407.3	(13/2⁺)	381.5	(15/2⁻)			
x54.7 *1*								$T_{1/2}$=5.8 ns *11* from (fragment)(fragment)(x ray)γ(t) (1974ClZX), γ probably a precursor of the 58.0γ. Iγ/100 fissions=0.183 *27* (1974ClZX).
58.5 *3*	<500	58.5	(7/2⁻)	0.0	(5/2⁺)			E_γ: 58.0 *1* (1974ClZX), 58.5 (2000Hw03). Iγ/100 fissions=0.421 *7* (1974ClZX).
86.5 *5*		86.5	(7/2⁺)	0.0	(5/2⁺)	M1	1.96 *4*	α(exp)=1.63 *22* (2015Wa28)
103.2 *3*	<80	161.7	(11/2⁻)	58.5	(7/2⁻)			E_γ: 103.2 (2000Hw03).
116.4 *5*		174.9	(9/2⁺)	58.5	(7/2⁻)			
x143 *1*								E_γ: from ce(K)=100 keV (1970Wa05). Mult.: consistent with E2 from K/L=3.6 (1970Wa05). $T_{1/2}$=1.8 ns *4* (1970Wa05) from (fragment)(fragment)(x ray)ce(t). I(ce)/100 fissions=0.32 (1970Wa05).
219.8 *3*	100 *5*	381.5	(15/2⁻)	161.7	(11/2⁻)			E_γ: 220.3 (2000Hw03).
232.4 *3*	20 *1*	407.3	(13/2⁺)	174.9	(9/2⁺)			
245.6 *3*	20 *1*	407.3	(13/2⁺)	161.7	(11/2⁻)			
278.5 *5*	15 *1*	365.0	(11/2⁺)	86.5	(7/2⁺)			
330.3 *3*	79 *5*	711.8	(19/2⁻)	381.5	(15/2⁻)			E_γ: 330.8 (2000Hw03).
344.7 *5*	6.9 *5*	752.0	(17/2⁺)	407.3	(13/2⁺)			
370.5 *5*	10 *1*	752.0	(17/2⁺)	381.5	(15/2⁻)			
371.6 *5*	10 *1*	736.6	(15/2⁺)	365.0	(11/2⁺)			
416.0 *3*	41 *3*	1127.9	(23/2⁻)	711.8	(19/2⁻)			E_γ: 415.8 (2000Hw03).
437.4@ *5*	4.2@ *4*	1174.0	(19/2⁺)	736.6	(15/2⁺)			
437.4@ *5*	11@ *1*	1189.3	(21/2⁺)	752.0	(17/2⁺)			
477.6 *5*	3.3 *4*	1189.3	(21/2⁺)	711.8	(19/2⁻)			
479.8 *3*	21 *1*	1607.8	(27/2⁻)	1127.9	(23/2⁻)			E_γ: 480.0 (2000Hw03).
490.7 *5*	1.4 *2*	1664.7	(23/2⁺)	1174.0	(19/2⁺)			
491.7 *5*	2.7 *3*	2722.5	(33/2⁺)	2230.8	(29/2⁺)			
506.4 *5*	7.5 *6*	1695.6	(25/2⁺)	1189.3	(21/2⁺)			
520.3 *5*	2.4 *5*	3185.1	(39/2⁻)	2664.8	(35/2⁻)			E_γ: 520.3 (2000Hw03).
522.5 *5*	7.8 *5*	2130.3	(31/2⁻)	1607.8	(27/2⁻)			E_γ: 522.5 (2000Hw03).
527.3 *5*	1.1 *1*	2192.0	(27/2⁺)	1664.7	(23/2⁺)			
534.5 *5*	5.7 *11*	2664.8	(35/2⁻)	2130.3	(31/2⁻)			E_γ: 534.5 (2000Hw03).
535.5 *5*	4.0 *4*	2230.8	(29/2⁺)	1695.6	(25/2⁺)			
538.9 *5*	1.1 *2*	3724.0	(43/2⁻)	3185.1	(39/2⁻)			
568.0 *5*	2.0 *2*	1695.6	(25/2⁺)	1127.9	(23/2⁻)			
622.7 *5*	<0.5	2230.8	(29/2⁺)	1607.8	(27/2⁻)			

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^{252}Cf SF decay 2015Wa28 (continued)

$\gamma(^{149}Pr)$ (continued)

† Uncertainty is stated as 0.5 keV for strong transitions and as much as 1 keV in prompt γ-spectra, whereas from ^{252}Cf SF decay, uncertainty is stated as 0.1 keV for strong γ rays and 0.5 for weaker lines. Evaluators assign 0.3 keV uncertainty for I$\gamma\geq$20 and 0.5 for Iγ<20, or when Iγ not stated.

‡ From ^{252}Cf SF decay, according to e-mail reply from the first author (E.H. Wang) of 2015Wa28 on Sept 17, 2015.

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.

@ Multiply placed with intensity suitably divided.

x γ ray not placed in level scheme.

^{252}Cf SF decay 2015Wa28

Level Scheme

Intensities: Relative I_γ

@ Multiply placed: intensity suitably divided

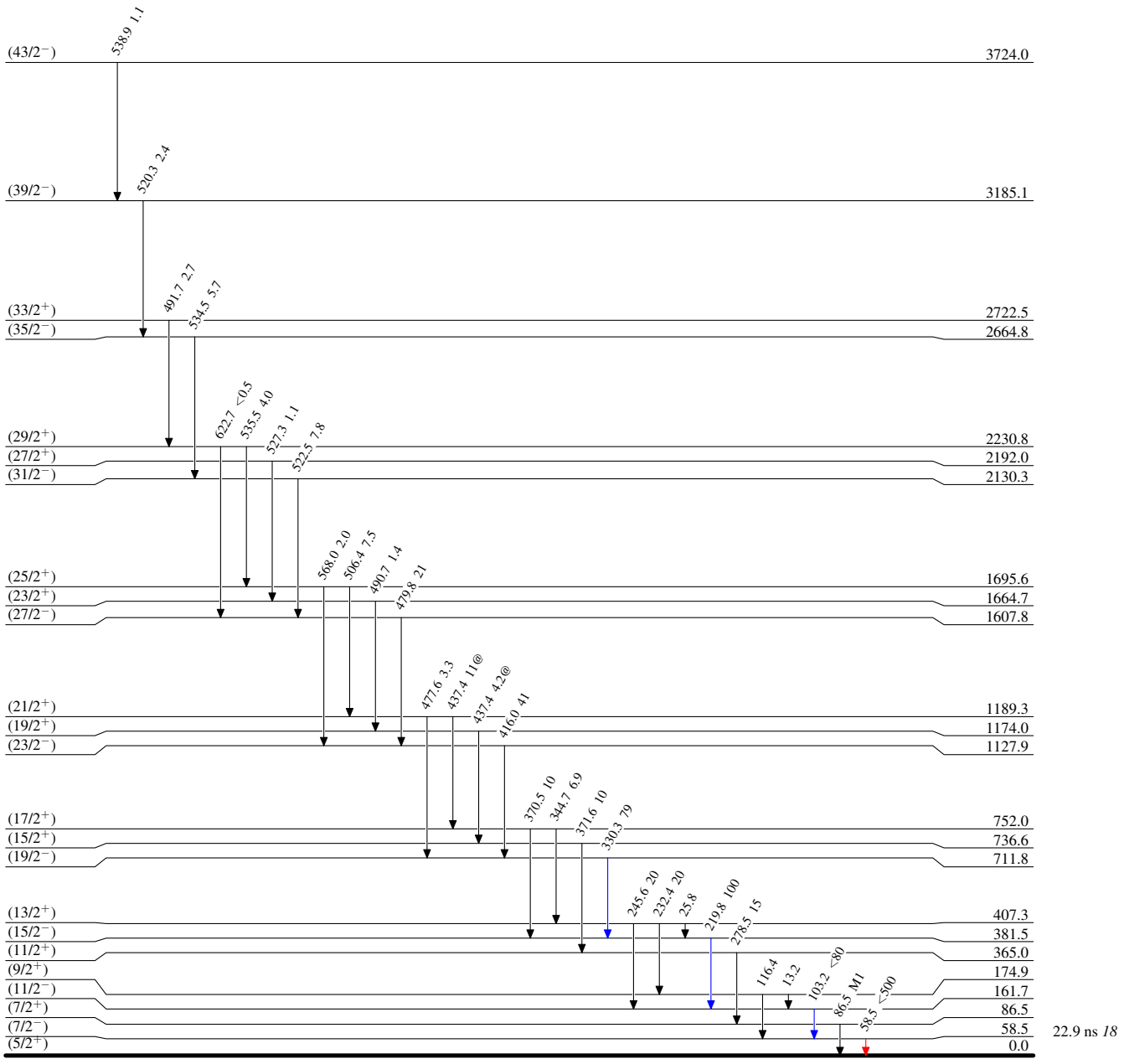
Legend

$I_\gamma < 2\% \times I_\gamma^{max}$

$I_\gamma < 10\% \times I_\gamma^{max}$

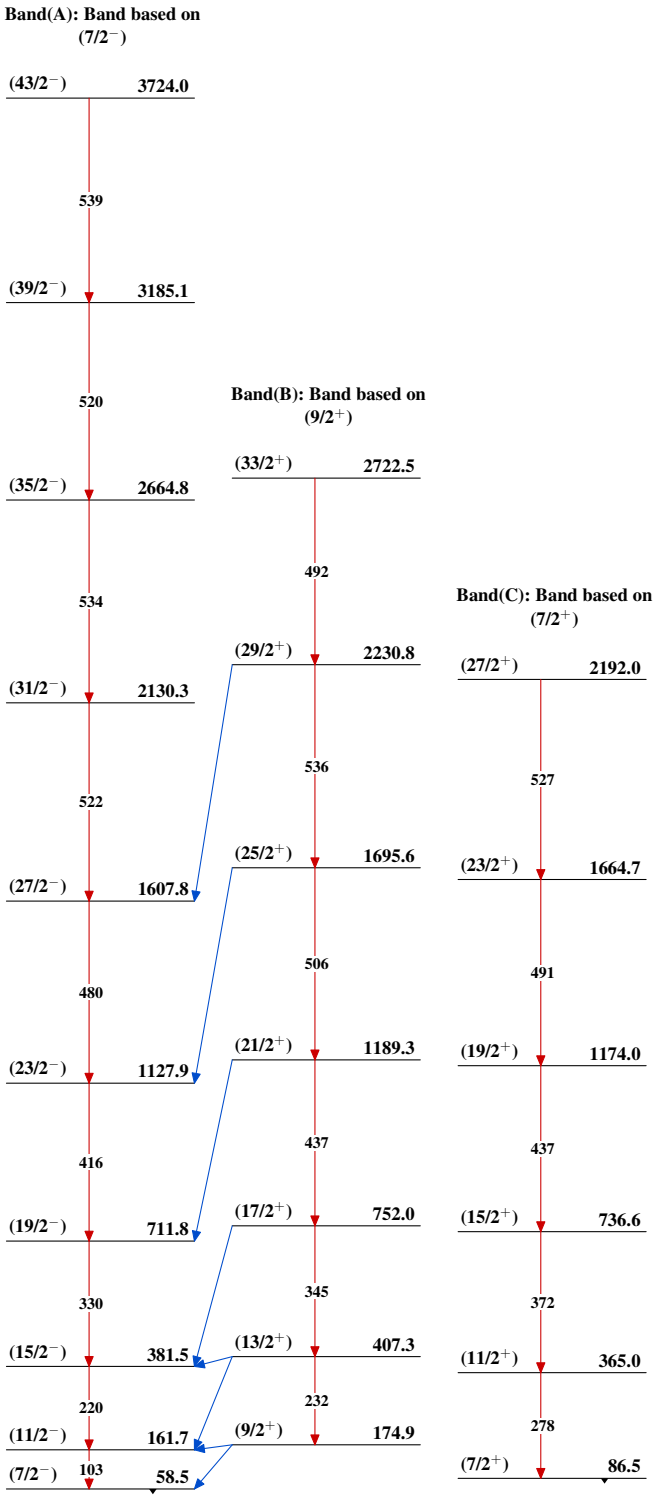
$I_\gamma > 10\% \times I_\gamma^{max}$

γ Decay (Uncertain)



$^{149}_{59}Pr_{90}$

^{252}Cf SF decay 2015Wa28



$^{149}_{59}Pr_{90}$