

²⁵²Cf SF decay 2014Wa53,2009Si21,1995Zh15

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 141, 1 (2017)	1-Feb-2017

Parent: ²⁵²Cf: E=0.0; J^π=0⁺; T_{1/2}=2.645 y δ; %SF decay=?

²⁵²Cf-T_{1/2}: From Adopted Levels of ²⁵²Cf in ENSDF database.

2014Wa53 was compiled for the XUNDL database by S. Kumar (Delhi Univ.) and B. Singh (McMaster); 2009Si21 was compiled by B. Karamy and B. Singh (McMaster).

2014Wa53 used ²⁵²Cf source ≈62 μCi sandwiched between two Fe foils with a thickness of 10 mg/cm² and placed in the center of Gammasphere array (at LBNL) consisting of 101 Compton-suppressed Ge detectors. A total of 5.7×10¹¹ triple-γ or higher-fold coincident events were collected. Measured E_γ, I_γ, γγγ and deduced levels, J, π, bands. Comparison with projected-shell model calculations.

2009Si21 measured E_γ, I_γ, γγ-coin and half-lives using the Gammasphere array (at ANL) of Anti-Compton Spectrometers. Comparison with QRPM calculations.

Other studies measured γγ coin, γ-fission product coin, and Xγ coin (1995Zh15,1970Wi16) and γγ(t) with EUROGAM II Ge detector array (1998Ga12). See also 1970ChYJ and 1970ChZH by same authors as 1970Wi16, 1974ClZX, and 1973TaZG.

The final level scheme is that of 2014Wa53 which includes that of 2009Si21, which includes that of 1995Zh15 (discussed by 1995ZhZV, 1997Do20, and 1997Ha64 without adding to it).

Unless stated otherwise all data are from 2014Wa53.

¹⁵⁸Sm Levels

E(level) [†]	J ^π [‡]	T _{1/2}	Comments
0.0 [#]	0 ⁺		
72.80 [#] 10	(2 ⁺)		T _{1/2} : > 2 ns given in 1970ChZH, but value not given in 1970Wi16 which is by the same authors.
240.30 [#] 15	(4 ⁺)		
498.40 [#] 17	(6 ⁺)		
842.4 [#] 3	(8 ⁺)		
1266.8 [#] 4	(10 ⁺)		
1279.70 ^{&} 17	(5 ⁻)	74 ns 6	T _{1/2} : weighted average of 72 ns 6 (2014Wa53, quoted by them from their measurement reported in: N.T. Brewer et al in "Fission and Properties of Neutron-rich Nuclei", Sanibel 2012) and 83 ns 12 (2009Si21); Others: 115 ns (1995Zh15; this value also appears in table V of 2009Si21 which seems a misprint); 1973TaZG report that the 167-keV γ follows an isomeric level with T _{1/2} = 164 ns (presumably the decay from this 5 ⁻ level was observed). J ^π : assigned by 1995Zh15 and 1998Ga12 based on calculations and in analogy with 5 ⁻ level in ¹⁵⁶ Sm at 1397 keV, and sustained by transitions to (4 ⁺) and (6 ⁺). Dominant configuration=ν5/2[642]⊗ν5/2[523].
1322.3 ^b 4	(5 ⁻)		J ^π : associated by 2014Wa53 with the predicted second (5 ⁻)-based band and partially sustained by the transition to (4 ⁺) (however the transition to (6 ⁺) as in the case of first (5 ⁻)-based band was not identified). Dominant configuration=π5/2[532]⊗π5/2[413].
1391.4 [@] 3	(6 ⁻)		
1422.3 ^a 5	(6 ⁻)		
1521.7 ^{&} 3	(7 ⁻)		
1540.9 ^b 5	(7 ⁻)		
1670.1 [@] 4	(8 ⁻)		
1679.8 ^a 6	(8 ⁻)		
1765.8 [#] 4	(12 ⁺)		
1836.2 ^b 6	(9 ⁻)		
1836.9 ^{&} 4	(9 ⁻)		
2012.8 ^a 7	(10 ⁻)		

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²⁵²Cf SF decay [2014Wa53](#),[2009Si21](#),[1995Zh15](#) (continued)

¹⁵⁸Sm Levels (continued)

E(level) [†]	J ^π [‡]	E(level) [†]	J ^π [‡]	E(level) [†]	J ^π [‡]	E(level) [†]	J ^π [‡]
2021.5 [@] 4	(10 ⁻)	2334.3 [#] 5	(14 ⁺)	2682.4 ^{&} 7	(13 ⁻)	3489.2 [@] 10	(16 ⁻)
2206.2 ^b 7	(11 ⁻)	2418.9 ^a 8	(12 ⁻)	2934.4 [@] 9	(14 ⁻)	4098.2? [@] 14	(18 ⁻)
2224.6 ^{&} 5	(11 ⁻)	2443.8 [@] 7	(12 ⁻)	2967.3? [#] 5	(16 ⁺)		

[†] From least-squares fit to E_γ data.

[‡] Based on the rotational character, systematics, and theoretical calculations.

[#] Band(A): K^π=0⁺ yrast band.

[@] Band(B): K^π=(5⁻) band based on 1279.7 level, α=0.

[&] Band(b): K^π=(5⁻) band based on 1279.7 level, α=1.

^a Band(C): K^π=(5⁻) band based on 1322.3 level, α=0.

^b Band(c): K^π=(5⁻) band based on 1322.3 level, α=1.

γ(¹⁵⁸Sm)

E _γ [†]	I _γ [‡]	E _i (level)	J _i ^π	E _f	J _f ^π	Comments
72.8 1		72.80	(2 ⁺)	0.0	0 ⁺	E _γ : 2014Wa53 seem to take this value from 1995Zh15 , figured like intense in the level scheme drawing (Fig. 3 therein) and for which the evaluator assume 0.1 keV uncertainty.
100.0 5	1.4 2	1422.3	(6 ⁻)	1322.3	(5 ⁻)	
111.7 3	8.0 8	1391.4	(6 ⁻)	1279.70	(5 ⁻)	I _γ : 1.9.
118.6 3	2.0 3	1540.9	(7 ⁻)	1422.3	(6 ⁻)	
130.3 3	4.9 3	1521.7	(7 ⁻)	1391.4	(6 ⁻)	I _γ : 1.3.
138.9 5	0.7 1	1679.8	(8 ⁻)	1540.9	(7 ⁻)	
148.4 3	3.1 3	1670.1	(8 ⁻)	1521.7	(7 ⁻)	
156.4 5	0.5 1	1836.2	(9 ⁻)	1679.8	(8 ⁻)	
166.8 3	3.5 3	1836.9	(9 ⁻)	1670.1	(8 ⁻)	
167.5 1	100 5	240.30	(4 ⁺)	72.80	(2 ⁺)	
176.6 5	0.6 3	2012.8	(10 ⁻)	1836.2	(9 ⁻)	
184.6 5	1.4 3	2021.5	(10 ⁻)	1836.9	(9 ⁻)	
193.4 5	0.4 1	2206.2	(11 ⁻)	2012.8	(10 ⁻)	
203.1 5	<0.1	2224.6	(11 ⁻)	2021.5	(10 ⁻)	
212.7 ^{&} 5		2418.9	(12 ⁻)	2206.2	(11 ⁻)	
218.6 5	1.3 2	1540.9	(7 ⁻)	1322.3	(5 ⁻)	
242.0 3	2.8 2	1521.7	(7 ⁻)	1279.70	(5 ⁻)	
257.5 3	2.6 4	1679.8	(8 ⁻)	1422.3	(6 ⁻)	
258.1 1	76 5	498.40	(6 ⁺)	240.30	(4 ⁺)	I _γ : 73.
278.7 3	4.1 4	1670.1	(8 ⁻)	1391.4	(6 ⁻)	
295.3 5	1.6 2	1836.2	(9 ⁻)	1540.9	(7 ⁻)	
315.2 3	3.9 4	1836.9	(9 ⁻)	1521.7	(7 ⁻)	
333.0 5	1.3 2	2012.8	(10 ⁻)	1679.8	(8 ⁻)	
344.0 [#] 2	46 [#]	842.4	(8 ⁺)	498.40	(6 ⁺)	
351.4 3	5.7 5	2021.5	(10 ⁻)	1670.1	(8 ⁻)	
370.0 5	0.8 1	2206.2	(11 ⁻)	1836.2	(9 ⁻)	
387.7 3	2.8 5	2224.6	(11 ⁻)	1836.9	(9 ⁻)	
406.1 5	1.0 2	2418.9	(12 ⁻)	2012.8	(10 ⁻)	
422.3 5	1.8 2	2443.8	(12 ⁻)	2021.5	(10 ⁻)	
424.4 [#] 2	24 [#]	1266.8	(10 ⁺)	842.4	(8 ⁺)	
457.8 5	<0.5	2682.4	(13 ⁻)	2224.6	(11 ⁻)	
490.6 5	<0.5	2934.4	(14 ⁻)	2443.8	(12 ⁻)	

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^{252}Cf SF decay 2014Wa53,2009Si21,1995Zh15 (continued) $\gamma(^{158}\text{Sm})$ (continued)

E_γ †	I_γ ‡	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Comments
499.0# 2	8.4#	1765.8	(12 ⁺)	1266.8	(10 ⁺)	
554.8 5		3489.2	(16 ⁻)	2934.4	(14 ⁻)	
568.5# 2	2.7#	2334.3	(14 ⁺)	1765.8	(12 ⁺)	
609& 1		4098.2?	(18 ⁻)	3489.2	(16 ⁻)	
633.0@ 2		2967.3?	(16 ⁺)	2334.3	(14 ⁺)	
781.3 3	7.1 6	1279.70	(5 ⁻)	498.40	(6 ⁺)	I_γ : 5.8.
1039.4 1	18 2	1279.70	(5 ⁻)	240.30	(4 ⁺)	I_γ : 6.1.
1082.0 3	6.0 8	1322.3	(5 ⁻)	240.30	(4 ⁺)	

† Uncertainty is stated by 2014Wa53 to be 0.1 keV for strong γ rays and up to 0.5 keV for weak γ rays. Evaluators (based on compilers initial assignment) assign 0.1 keV for γ rays with $I_\gamma > 10$, 0.3 keV for $I_\gamma = 2-10$ and 0.5 keV for $I_\gamma < 2$.

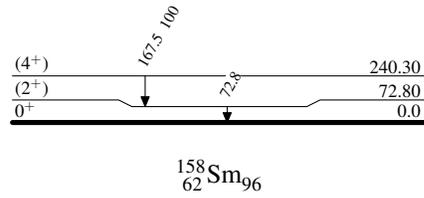
‡ Intensities relative to 167 γ measured by 2014Wa53. In comments: same, but measured by 1995Zh15 (or adopted when noted); 2009Si21 reported relative photon branching from each level.

Energy from 2009Si21 and relative intensity from 1995Zh15.

@ Energy from 2009Si21.

& Placement of transition in the level scheme is uncertain.

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Level Scheme (continued)Intensities: Relative I_γ 

^{252}Cf SF decay 2014Wa53,2009Si21,1995Zh15

