^{248}Cm,^{252}Cf SF decay

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	C. W. Reich	NDS 113, 2537 (2012)	1-Mar-2012

Parent: ^{248}Cm: E=0; $J^{\pi}=0^+$; $T_{1/2}=3.48\times10^5$ y *6*; %SF decay=8.39 *16*

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

Additional information 1.

1994Sm07: ^{156}Nd produced in the SF decay of ^{248}Cm. The source consisted of ≈5 mg of curium oxide mixed with 65 mg KCl and pressed in the form of a 7-mm diameter pellet. The emitted γ radiation was studied using the EUROGAM phase 1 array of Compton-suppressed Ge detectors. Measured the lifetimes of the levels interpreted as the 12^+, 14^+ and 16^+ members of the yrast (i.e., g.s.) band using a modified DSAM technique (the Doppler profile method). Also measured Eγ, but report only level energies with no uncertainties.

1995Zh39: ^{156}Nd obtained as a product of the SF decay of ^{252}Cf. The ^{252}Cf source strength was $\approx6\times10^4$ fissions/s. The γ radiation was studied using an array of 20 Compton-suppressed Ge detectors, with Eγ, $\gamma\gamma$ being measured. γ radiation, including $\gamma\gamma\gamma$, was also measured using the early implementation of Gammasphere, having 36 large Ge detectors and one low-energy photon spectrometer. XX and Xγ coincidences were measured using two x-ray detectors having resolutions of 280 eV at 14 keV and three Ge detectors. Authors report Eγ values only, with no uncertainties.

1998Ga12: ^{156}Nd produced as a product of the SF of ^{252}Cf. Fission fragments were detected in the SAPhIR detector, consisting of 48 photovoltaic cells, each having an active area of 3 cm^2 and a thickness of 500 μ. γ's detected using the EUROGAM II array, composed of 54 Compton-suppressed Ge detectors: 30 coaxial detectors at forward and backward angles; and 24 clover detectors around 90°. Prompt and delayed γ's (0 to 1 μs) following fission were detected using the Ge detectors of EUROGAM II. Measured fragment-fragment-γ and fragment-fragment-$\gamma\gamma\gamma$ coincidences. Report one isomeric level with two deexciting γ's and the g.s. band up through the 12^+ member, together with nuclear-model calculations of the spectrum of the low-lying two-quasiparticle states.

2009Si21: ^{156}Nd produced as a product of the SF of ^{252}Cf. Fission fragments were detected using the Gammasphere array of anti-Compton spectrometers at Argonne National Laboratory. Measured Eγ, Iγ, $T_{1/2}$, $\gamma\gamma$ coin in various combinations of prompt and delayed γ's. Report members of the g.s. band up through the 16^+ member and a rotational band up through the (13^-) member built on the (5^-) isomeric level. Comparison with the results of quasiparticle-rotor model calculations.

2010SiZZ: Same authors as 2009Si21. Presents a condensed version of the information in 2009Si21.

2000Ma42 report the results of a cranked Hartree-Fock-Bogoliubov calculation of the energies and relative g-factors of the members of the g.s. band up through the 10^+ level. See the comment on this matter in the Adopted Levels data set.

Unless noted otherwise, the data are from the study of 2009Si21. Where these overlap, there is essential agreement among the various studies.

^{156}Nd Levels

E(level)[†]	J^{π}[‡]	$T_{1/2}$[#]	Comments
0	0^+	5.26 s *20*	$T_{1/2}$: from the Adopted Levels.
67.2[@] *2*	2^+		
222.2[@] *3*	4^+		
460.7[@] *4*	6^+		
778.2[@] *4*	8^+		
1169.0[@] *5*	10^+		
1431.3[&] *4*	(5^-)	0.36 μs *15*	$T_{1/2}$: from 2009Si21, delayed γ(t). The value actually listed by these authors is 356 ns *145*. 1998Ga12, from delayed γ's from fission, list $T_{1/2}$=135 ns (or 0.135 μs).
1531.9[a] *4*	(6^-)		
1628.5[@] *5*	12^+	2.4 ps	
1649.4[&] *4*	(7^-)		
1783.7[a] *4*	(8^-)		
1934.5[&] *4*	(9^-)		
2101.9[a] *4*	(10^-)		

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^{248}Cm,^{252}Cf SF decay (continued)

^{156}Nd Levels (continued)

E(level)[†]	J$^{\pi}$[‡]	T$_{1/2}$[#]
2151.7[@] *6*	14$^+$	1.2 ps
2286.2[&] *4*	(11$^-$)	
2485.1[a] *5*	(12$^-$)	
2713.0[&] *5*	(13$^-$)	
2737.1[@]	16$^+$	0.76 ps

[†] From a least-squares fit by the evaluator to the listed Eγ values.
[‡] Values for the g.s. band are assigned by 1994Sm07 and 1995Zh39, based on considerations of rotational-band energy spacings and the deexcitation characteristics of the highly excited, high-spin, states produced in the spontaneous-fission process. The fact that the B(E2)(W.u.) values deduced from the measured lifetimes, assuming that the γ transitions are E2, are typical of those of collective intraband E2′s supports these assignments. The spin assignment of the isomer is that from 1998Ga12, based on Hartree-Fock-Bogoliubov calculations. Those of the excited band members are those from 2009Si21 and are based on the usual considerations of rotational-band structure in strongly deformed nuclei.
[#] From 1994Sm07, unless noted otherwise. These authors give no uncertainties for these values.
[@] Band(A): K$^{\pi}$=0$^+$, g.s. band.
[&] Band(B): K$^{\pi}$=(5$^-$) band, α=1 branch. Probable conf=ν5/2[642]+ν5/2[523].
[a] Band(b): K$^{\pi}$=(5$^-$) band, α=0 branch. Probable conf=ν5/2[642]+ν5/2[523].

γ(^{156}Nd)

E$_i$(level)	J$_i^{\pi}$	E$_{\gamma}$[†]	I$_{\gamma}$[‡]	E$_f$	J$_f^{\pi}$	Comments
67.2	2$^+$	67.2 *2*		0	0$^+$	
222.2	4$^+$	155.0 *2*		67.2	2$^+$	
460.7	6$^+$	238.6 *2*		222.2	4$^+$	
778.2	8$^+$	317.5 *2*		460.7	6$^+$	
1169.0	10$^+$	390.8 *2*		778.2	8$^+$	
1431.3	(5$^-$)	970.6 *2*	100 *10*	460.7	6$^+$	
		1209.0 *2*	70 *15*	222.2	4$^+$	
1531.9	(6$^-$)	100.4 *2*		1431.3	(5$^-$)	
1628.5	12$^+$	459.5 *2*		1169.0	10$^+$	
1649.4	(7$^-$)	117.5 *2*	110 *20*	1531.9	(6$^-$)	
		218.4 *2*	100	1431.3	(5$^-$)	
1783.7	(8$^-$)	134.3 *2*	120 *20*	1649.4	(7$^-$)	
		251.5 *2*	100	1531.9	(6$^-$)	
1934.5	(9$^-$)	151.0 *2*	160 *28*	1783.7	(8$^-$)	
		285.3 *2*	100	1649.4	(7$^-$)	
2101.9	(10$^-$)	167.5 *2*	100 *22*	1934.5	(9$^-$)	
		317.8 *2*	100	1783.7	(8$^-$)	
2151.7	14$^+$	523.2 *2*		1628.5	12$^+$	
2286.2	(11$^-$)	184.1 *2*	80 *26*	2101.9	(10$^-$)	
		351.9 *2*	100	1934.5	(9$^-$)	
2485.1	(12$^-$)	199.0 *2*	70 *29*	2286.2	(11$^-$)	
		383.2 *2*	100	2101.9	(10$^-$)	
2713.0	(13$^-$)	227.7[#] *2*	30 *18*	2485.1	(12$^-$)	
		426.8 *2*	100	2286.2	(11$^-$)	
2737.1	16$^+$	585.4		2151.7	14$^+$	Eγ: from 1994Sm07. 1995Zh39 report Eγ=583.1. 2009Si21 report Eγ=582 and show it as questionable.

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^{248}Cm,^{252}Cf SF decay (continued)

$\gamma(^{156}Nd)$ (continued)

† Uncertainties (0.2 keV) are from a general statement in 2009Si21.
‡ For absolute intensity per 100 decays, multiply by 0.704 *19*.
# Placement of transition in the level scheme is uncertain.

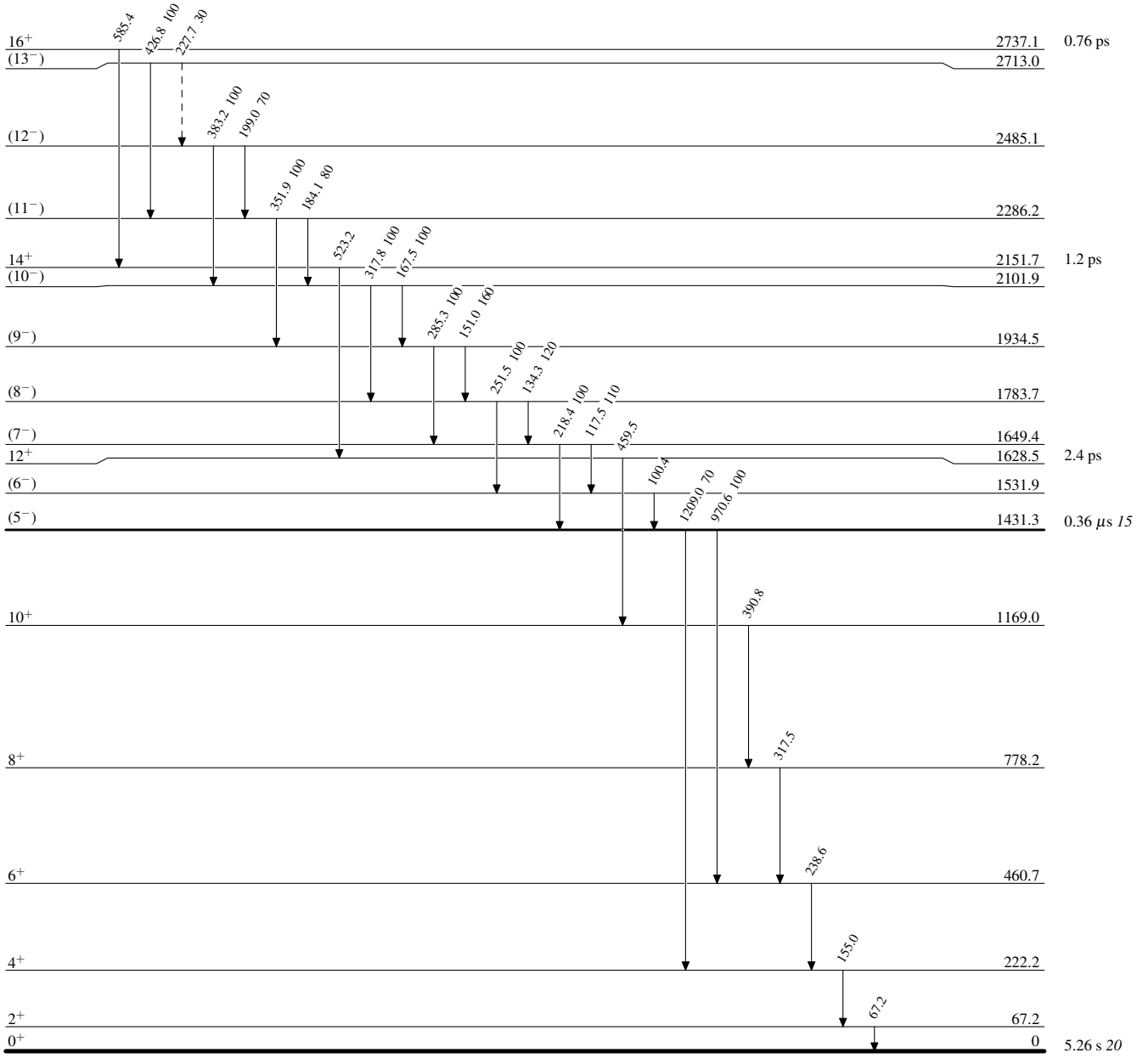
^{248}Cm,^{252}Cf SF decay

Legend

Level Scheme

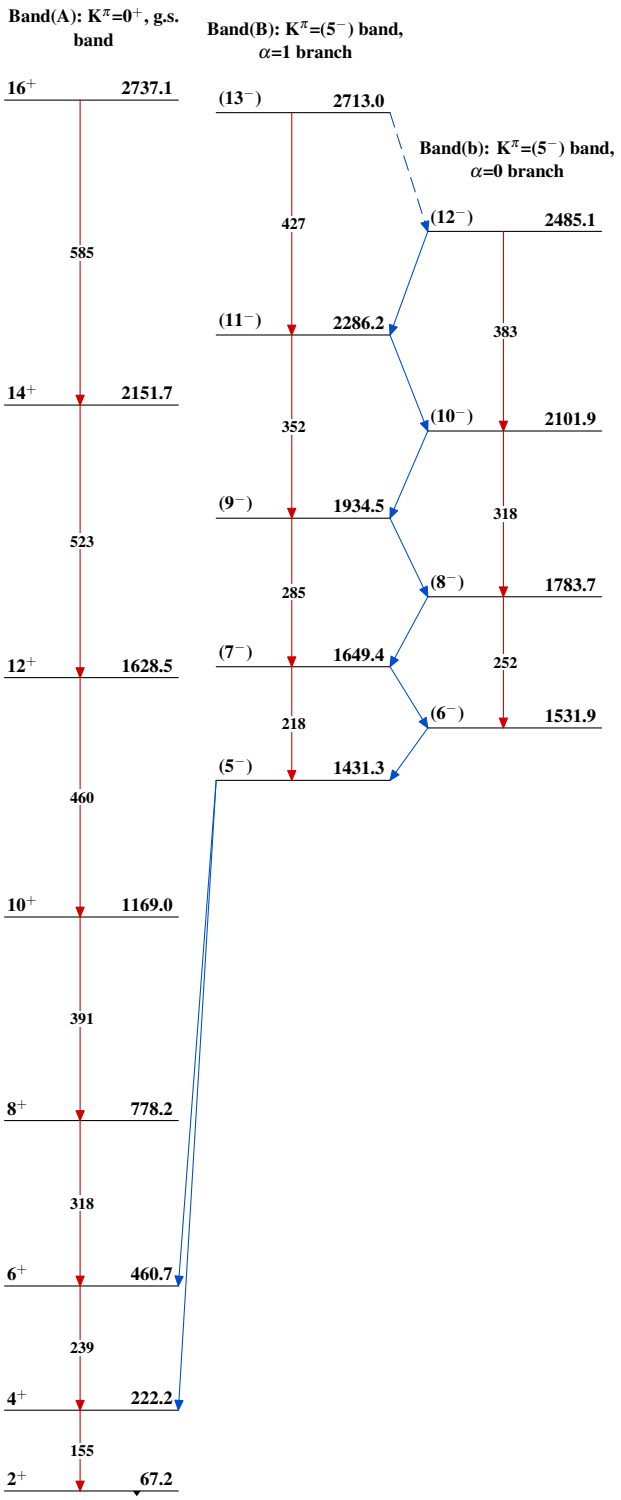
Intensities: Relative photon branching from each level

– – – – – – ► γ Decay (Uncertain)



$^{156}_{60}Nd_{96}$

^{248}Cm,^{252}Cf SF decay



$^{156}_{60}Nd_{96}$