

^{245}Cf α decay **1996Ma72**

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	C. D. Nesaraja	NDS 130, 183 (2015)	30-Sep-2015

Parent: ^{245}Cf : $E=0$; $J^\pi=1/2^+$; $T_{1/2}=45.0$ min 13; $Q(\alpha)=7258.5$ 18; $\% \alpha$ decay=35.3 25

^{245}Cf - $Q(\alpha)$: From [2012Wa38](#).

^{245}Cf - J^π : From Adopted Levels in ^{245}Cf ([2011Br03](#)).

^{245}Cf - $T_{1/2}$: From Adopted Levels in ^{245}Cf which is the unweighted average of 43.6 min 8 ([1967Fi04](#)) and 46.4 min 3 ([1996Ma32](#)).

Other measurement: 44 min ([1956Ch43](#)).

^{245}Cf - $\% \alpha$ decay: From Adopted Levels of ^{245}Cf in [2011Br03](#) who used a corrected value for $I_\gamma(253)=30.6$ from ^{245}Bk ε decay ([1996Ma27](#)).

[2004He28](#): α and γ decay studies of $^{253}\text{No} \rightarrow ^{249}\text{Fm} \rightarrow ^{245}\text{Cm}$ were performed at GSI, Darmstadt. α -decays were measured with the position sensitive 16 strips PIPS detector and γ -rays with a clover detector consisting of four Ge detectors. Determined $E\alpha$, $I\alpha$ and branching ratio and $t_{1/2}$ of ^{245}Cf .

[1996Ma27](#): ^{245}Cf produced by the $^{238}\text{U}(^{12}\text{C},5n)$ reaction which was then followed by radiochemical separation. The α decay, X-ray and γ rays were measured using a Si-surface barrier detector, a low energy photon detector and a HpGe detector, respectively.

[1967Fi04](#): Properties of ^{245}Cf observed using the A pulse analysis.

 ^{241}Cm Levels

E(level)	J^π	Comments
0 [†]	1/2 ⁺	
5.5 [†]	(3/2 ⁺)	E(level): From energy difference of transitions from the 56.1 level.
56.1 [†]	(5/2 ⁺)	
81? [†]	(7/2 ⁺)	
124?	(7/2 ⁺)	
163? [†]	(9/2 ⁺)	

[†] Band(A): 1/2[631].

 α radiations

$E\alpha^{\ddagger @}$	E(level)	$I\alpha^{\# @ \&}$	HF [†]	Comments
6978 ^a	163?	0.31	138	
7016 ^a	124?	0.31	198	
7058 ^a	81?	0.68	134	
7084 10	56.1	7.0	16	$E\alpha$: From 2004He28 . 1996Ma72 report 7083 with no uncertainty. $I\alpha$: Other: 7.8 (2004He28).
7137.9 19	0	91.7	2.1	$E\alpha$: Weighted average of 7136.8 20 (1967Fi04) and 7145 5 (1996Ma72). The published value of 1967Fi04 has been adjusted by 1991Ry01 to account for changes in the calibration energies. The uncertainty in the value of 1996Ma72 has been taken from 2012Wa38 . The authors do not give an uncertainty in their publication. Other: 7142 5, with an additional systematic uncertainty of 10 keV (2004He28). $I\alpha$: Others: 91.3% (2004He28).

[†] $r_0(^{241}\text{Cm})=1.4952$ 64 average of $r_0(^{241}\text{Cm})=1.495$ 12 and $r_0(^{242}\text{Cm})=1.4953$ 9, is used in the calculations as given in [1998Ak04](#).

[‡] From [1996Ma72](#), except as noted for the branches to the g.s. and 56 keV level. The authors' values, relative to their value of 7145 for the g.s. branch, have been lowered by 7 keV to account for the adopted value of 7137.9 for the g.s. branch.

Continued on next page (footnotes at end of table)

^{245}Cf α decay **1996Ma72** (continued) α radiations (continued)

From **1996Ma72**.

@ The data for ^{245}Cf α decay are not consistent with systematics. Other nuclides with configuration=1/2[631] whose α decay have been studied are ^{239}Pu and ^{241}Cm , both with N=145. For ^{245}Cf α decay, the levels that are expected to be fed, given the sensitivity of the work of **1996Ma72** are the members of the 1/2[631] g.s. band whose feeding in ^{239}Pu α decay give hindrance factors of 2.76, 9.49, 7.76, 765, and 1260 (**2014Br17**) for the 1/2, 3/2, 5/2, and 7/2 members, respectively. In ^{241}Cm α decay the values are 2.5 3, 8.2 9, 7.5 8, 490 19, and ≈ 370 , consistent with, but not as precisely known as for ^{239}Pu decay. From the energies of the 1/2⁺, 3/2⁺, and 5/2⁺ observed members of the g.s. 1/2[631] band, the authors calculate the 7/2⁺ member to be at 69 keV and the 9/2⁺ member to be at 160 keV. Using the hindrance factors from ^{239}Pu α decay, one gets predicted intensities for branches to the 1/2⁺ to 9/2⁺ levels of about 70%, 18%, 15%, 0.08%, and 0.04%, respectively. The branches to the 1/2⁺ and 3/2⁺ members would of course not be resolved. The authors suggest that the 81 keV level, defined by their 7058 α branch, is the band head of the 5/2[622] band; however, it has been shown in ^{245}Bk ε decay that this band head lies at 267.8 keV, and from a hindrance factor of 3300 for the branch to this level in ^{239}Pu α decay, one expects $I_{\alpha} \approx 0.003\%$ for this branch in ^{245}Cf α decay, too small to have been seen. The 7058 α may correspond to the 7/2⁺ member of the g.s. band instead; however, its intensity is much larger than expected, as is the branch to the probable 9/2⁺ member. The 7016 α may be spurious since no level is expected at 122 keV, especially with such a hindrance factor.

& For absolute intensity per 100 decays, multiply by 0.353 25.

^a Existence of this branch is questionable.

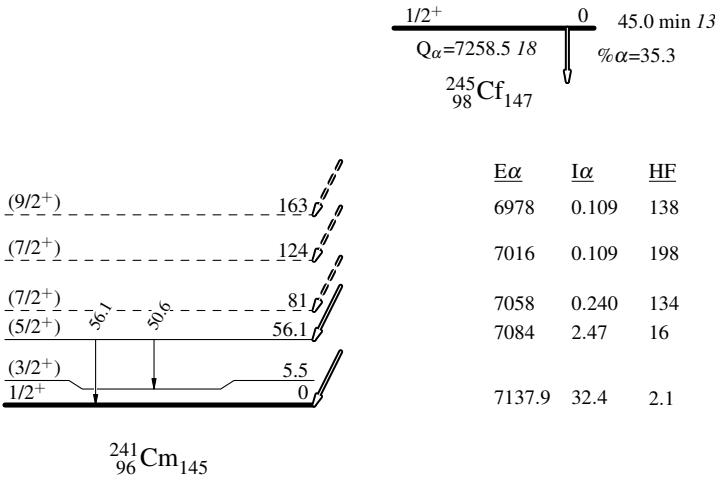
 $\gamma(^{241}\text{Cm})$

$E_{\gamma}^{\dagger}$	$E_i(\text{level})$	J_i^{π}	E_f	J_f^{π}
50.6	56.1	(5/2 ⁺)	5.5	(3/2 ⁺)
56.1	56.1	(5/2 ⁺)	0	1/2 ⁺

[†] From **1996Ma72**.

^{245}Cf α decay 1996Ma72

Decay Scheme

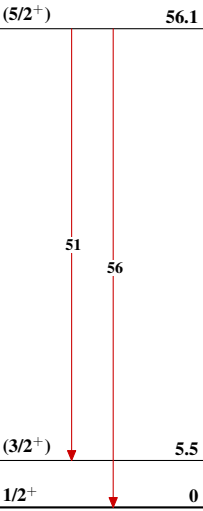


^{245}Cf α decay 1996Ma72

Band(A): 1/2[631]

(9/2⁺) 163

(7/2⁺) 81



$^{241}_{96}\text{Cm}_{145}$