

^{214}Fr α decay (3.35 ms) 2005Ku06,1968To10

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	M. Shamsuzzoha Basunia		NDS 121, 561 (2014)	31-Mar-2014

Parent: ^{214}Fr : $E=122.5$; $J^\pi=(8^-)$; $T_{1/2}=3.35$ ms 5; $Q(\alpha)=8589.4$; $\% \alpha$ decay=100.0

^{214}Fr - $Q(\alpha)$: Other: 8586.6 from $E\alpha=8545.5$ (2005Ku06).

2005Ku06: ^{214}Fr was produced from $^{209}\text{Bi}(^{12}\text{C},\alpha 3n)$ reaction, $E=7.1$ MeV/nucleon, Evaporation residues were separated by Velocity filter ship and implanted into position-sensitive 16-strip pips Si-detector. Measured $E\gamma$, $E\alpha$, $I\gamma$, $I\alpha$, $\gamma\gamma$, α - γ coin with a Ge Clover detector placed behind Si detector.

1968To10: ^{214}Fr was produced from $^{208}\text{Pb}(^{11}\text{B},5n)$ reaction, $E=50$ to 95 MeV, 99.3% enriched ^{208}Pb target. Recoiled products were thermalized in helium, swept to an evacuated chamber, and collected on a metal drum. α particles were detected using a Si(Au) surface barrier detector, FWHM=25 keV. Measured $E\alpha$, $I\alpha$.

 ^{210}At Levels

E(level) [†]	J^π [‡]	$T_{1/2}$	Comments
0.0	(5) ⁺	8.1 h 4	
72.77 18	(4) ⁺		
496.2 5	(4) ⁺		E(level): In 2005Ku06 – it is speculated that this level was not fed by α -decay. Observed γ rays can be explained by the presence of internally converted transitions from levels at 507 and/or 531 keV. The α -energy distribution for this level is difficult to explain based on direct α -decay only.
507.38 19	(6) ⁺		
531.1 4	(3) ⁺		E(level): In 2005Ku06 – it is speculated that this level was not fed by α -decay but rather by internally converted transitions from levels above it.
576.7 3	(7) ⁺		
594 7			
603.5 5			
847.11 25			E(level): Other: 854.7 (1968To10) from 7708 α 5.
966.2 6			E(level): Other: 970.7 (1968To10) from 7594 α 5.
1228 7			E(level): may correspond with (7 ⁺), 1222-keV state via ($\alpha,3n\gamma$) reaction.

[†] From least-squares fit to γ -ray energies, unless otherwise noted.

[‡] From Adopted Levels.

 α radiations

$E\alpha$ [‡]	E(level)	$I\alpha$ ^{#&}	HF [†]	Comments
7341 8	1228	0.05	79	$E\alpha$: From 1968To10.
7591 15	966.2	0.5	54	$E\alpha$: Other: 7594.5 (1968To19).
7715 5	847.11	1.1	57	$E\alpha$: Other: 7708.5 (1968To19).
7953 @a 6	603.5			
7963 5	594	0.7	505	$E\alpha$: From 1968To10. This $E\alpha$ is not reported in 2005Ku06 and speculated to be a doublet of 7953 α and 7979 α .
7979 5	576.7			
8024 @a 6	531.1			$E\alpha$: 8027.4: calculated using $Q\alpha=8589.4$ (2012Wa38) by evaluator.
8046 5	507.38	0.9	695	$E\alpha$: Same value both in 2005Ku06 and 1968To10.
8058 @a 6	496.2			$E\alpha$: 8061.4: calculated using $Q\alpha=8589.4$ (2012Wa38) by evaluator.
8478 5	72.77	50.9	187	$E\alpha$: recommended by 1991Ry01, based on 8477.5 (1968To10). Other measurements: 8477.8 (1968Va18) and 8472.5 (2005Ku06). $I\alpha$: $I\alpha=49.2$ (1968Va18); $I\alpha=50.3$ (1991Ry01).
8546 3	0.0	46	319	$E\alpha$: Weighted average of 8545.5 (2005Ku06), 8549.8 (1968Va18), and 8546.5 (1968To10). Other: 8547.4 – recommended in 1991Ry01, based on later two values from 1968Va18 and 1968To10. Other measurements: 8530 (1966Ro12), 8550 (1962Gr20). $I\alpha$: $I\alpha=51.2$ (1968Va18); $I\alpha=48.3$ (1991Ry01).

Continued on next page (footnotes at end of table)

^{214}Fr α decay (3.35 ms) **2005Ku06,1968To10** (continued) α radiations (continued)

† Using $r_0(^{210}\text{At})=1.4906$, average of $r_0(^{208}\text{Po})=1.4343$ 34, $r_0(^{210}\text{Po})=1.532$ 6, $r_0(^{210}\text{Rn})=1.4552$ 21, and $r_0(^{212}\text{Rn})=1.541$ 5 (1998Ak04).

‡ From 2005Ku06, unless otherwise noted.

From 1968To10, unless otherwise noted.

@ Calculated value in 2005Ku06.

& Absolute intensity per 100 decays.

^a Existence of this branch is questionable.

 $\gamma(^{210}\text{At})$

<u>$E_i(\text{level})$</u>	<u>J_i^π</u>	<u>E_γ^\dagger</u>	<u>I_γ^\dagger</u>	<u>E_f</u>	<u>J_f^π</u>	<u>$E_i(\text{level})$</u>	<u>J_i^π</u>	<u>E_γ^\dagger</u>	<u>I_γ^\dagger</u>	<u>E_f</u>	<u>J_f^π</u>
72.77	(4) ⁺	72.8 2	100	0.0	(5) ⁺	576.7	(7) ⁺	576.7 3	100	0.0	(5) ⁺
496.2	(4) ⁺	423.1 6	100 45	72.77	(4) ⁺	603.5		530.7 4	100	72.77	(4) ⁺
		496.6 6	64 18	0.0	(5) ⁺	847.11		774.7 4	78 21	72.77	(4) ⁺
507.38	(6) ⁺	434.4 6	10 4	72.77	(4) ⁺			846.9 3	100 17	0.0	(5) ⁺
		507.4 2	100 11	0.0	(5) ⁺	966.2		966.2 6	100	0.0	(5) ⁺
531.1	(3) ⁺	458.3 3	100	72.77	(4) ⁺						

† From 2005Ku06.

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Decay Scheme

Legend

Intensities: Relative photon branching from each level

● Coincidence

