^{206}Fr $\varepsilon+\beta^+$ decay 1981Ri02

History Type	Author	Citation	Literature Cutoff Date
Full Evaluation	F. G. Kondev	NDS 201,346 (2025)	21-Jan-2025

Parent: ^{206}Fr: E=0; $J^\pi=3^+$; $T_{1/2}\approx16$ s; Q(ε)=7886 *29*; %ε+%β^+ decay=11.6 *33*

Parent: ^{206}Fr: E=0+x; $J^\pi=7^+$; $T_{1/2}\approx16$ s; Q(ε)=7886 *29*; %ε+%β^+ decay=15.3 *15*

1981Ri02: ^{206}Fr produced by Ir(^{20}Ne,xn) reaction on natural target with E(^{20}Ne)≈115 MeV followed by isotope separation. Ge(Li) and Si(Li) detectors were used to measure γ and ce spectra, and $\gamma\gamma$ coincidences.

The decay scheme involves decay of two states in ^{206}Fr with $J^\pi=3^+$ and 7^+. This is confirmed by the β^++ε feedings to low spin 2^+ and 4^+ levels, as well as to high-spin 6^+ and 8^+ states. The large Q value in the β^++ε decay of ^{206}Fr suggests that many other, yet unobserved, states are populated. The β^++ε feedings and corresponding log *ft* values could not be determined unambiguously.

^{206}Rn Levels

E(level)[†]	J^π[‡]	$T_{1/2}$[‡]	Comments
0.0	0^+	5.67 min *17*	
575.30 *10*	2^+		
1134.30 *15*	4^+		
1501.80 *15*	$(2^-,3)$		
1762.90 *18*	6^+	1.8 ns *13*	$T_{1/2}$: From 282.3γ-628.6γ(Δt) in 1981Ri02 using the centroid shift method.
1818.30 *18*	$(6)^+$		
1924.30 *20*	8^+	6.3 ns *24*	$T_{1/2}$: From 282.3γ-161.4γ(Δt) in 1981Ri02 using the centroid shift method.
2024.90 *18*			
2174.30 *20*			
2206.90 *23*	$(7,8)^+$		
2269.90 *23*	9^-		

[†] From a least-squares fit to Eγ.

[‡] From Adopted Levels.

$\gamma(^{206}Rn)$

E_γ[†]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	α[#]	Comments
161.4 *1*	10.0 *22*	1924.30	8^+	1762.90	6^+	E2	1.159	α(K)=0.249 *4*; α(L)=0.672 *10*; α(M)=0.180 *3*; α(N+..)=0.0576 *9* α(N)=0.0470 *7*; α(O)=0.00953 *14*; α(P)=0.001080 *16* Mult.: α(L)exp=0.65 *7*.
[x]197.8 *1*	4.9 *10*					E2	0.544	α(K)=0.1683 *24*; α(L)=0.278 *4*; α(M)=0.0743 *11*; α(N+..)=0.0237 *4* α(N)=0.0193 *3*; α(O)=0.00394 *6*; α(P)=0.000453 *7* Mult.: α(K)exp=0.34 *17*.
[x]274.9 *1*	2.4 *4*							
282.6 *1*	8.3 *9*	2206.90	$(7,8)^+$	1924.30	8^+	M1	0.704	α(K)=0.570 *8*; α(L)=0.1021 *15*; α(M)=0.0242 *4*; α(N+..)=0.00790 *11* α(N)=0.00631 *9*; α(O)=0.001382 *20*; α(P)=0.000202 *3* Mult.: α(K)exp=0.51 *7*.
345.6 *1*	3.3 *14*	2269.90	9^-	1924.30	8^+	E1	0.0242	α(K)=0.0197 *3*; α(L)=0.00344 *5*; α(M)=0.000813 *12*; α(N+..)=0.000262 *4* α(N)=0.000210 *3*; α(O)=4.52×10^{-5} *7*; α(P)=6.27×10^{-6} *9*
356.0 *1*	3.1 *20*	2174.30		1818.30	$(6)^+$			

Continued on next page (footnotes at end of table)

^{206}Fr $\varepsilon+\beta^+$ decay 1981Ri02 (continued)

$\gamma(^{206}Rn)$ (continued)

E_γ †	I_γ †	E_i(level)	J_i^π	E_f	J_f^π	Mult. ‡	α #	Comments
559.0 *1*	70.0 *21*	1134.30	4^+	575.30	2^+	E2	0.0271	α(K)=0.0189 *3*; α(L)=0.00615 *9*; α(M)=0.001550 *22*; α(N+..)=0.000500 *7* α(N)=0.000403 *6*; α(O)=8.51×10^{-5} *12*; α(P)=1.109×10^{-5} *16* Mult.: α(K)exp=0.015 *5*.
575.3 *1*	100	575.30	2^+	0.0	0^+	E2	0.0254	α(K)=0.0179 *3*; α(L)=0.00565 *8*; α(M)=0.001421 *20*; α(N+..)=0.000458 *7* α(N)=0.000370 *6*; α(O)=7.81×10^{-5} *11*; α(P)=1.022×10^{-5} *15* Mult.: α(K)exp=0.013 *5*.
628.6 *1*	31.0 *27*	1762.90	6^+	1134.30	4^+	E2	0.0209	α(K)=0.01508 *22*; α(L)=0.00438 *7*; α(M)=0.001094 *16*; α(N+..)=0.000353 *5* α(N)=0.000285 *4*; α(O)=6.03×10^{-5} *9*; α(P)=7.99×10^{-6} *12* Mult.: α(K)exp=0.016 *5*.
684.0 *1*	8.3 *21*	1818.30	$(6)^+$	1134.30	4^+	E2	0.01744	α(K)=0.01283 *18*; α(L)=0.00347 *5*; α(M)=0.000861 *12*; α(N+..)=0.000278 *4* α(N)=0.000224 *4*; α(O)=4.76×10^{-5} *7*; α(P)=6.38×10^{-6} *9*
890.6 *1*	6.1 *20*	2024.90		1134.30	4^+			
926.5 *1*	8.0 *20*	1501.80	$(2^-,3)$	575.30	2^+			

† From 1981Ri02.
‡ From Adopted Levels. Specific results from ce measurements in 1981Ri02 are also presented.
# Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with "Frozen Orbitals" approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.
x γ ray not placed in level scheme.

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Decay Scheme

Intensities: Relative I_γ