

Adopted Levels

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh, M. S. Basunia, Jun Chen et al. ,		NDS 192,315 (2023)	25-Sep-2023

$Q(\beta^-)=2058$ 9; $S(n)=4970$ 9; $S(p)=5382$ 9; $Q(\alpha)=5853$ 14 [2021Wa16](#)

$S(2n)=11247$ 8, $S(2p)=12576$ 16 ([2021Wa16](#)).

[1950Hy20](#): ^{222}Fr produced and identified in $^{232}\text{Th}(p,X)$ at LBNL, measured $T_{1/2}$ of its decay.

[1973AfZV](#), [1976VaZC](#): measured $T_{1/2}$ of decay of ^{222}Fr .

[1979Ca16](#): measured yield in $U(p,X), E=600$ MeV reaction.

[1986Au02](#): measured mass excess.

[1992Bo28](#): measured mass excess using tandem Penning trap mass spectrometer at ISOLDE-CERN facility.

[2009Pa49](#): measured yield in $^{238}\text{U}(p,X), E=1$ GeV/nucleon.

[2014Kr09](#): measured mass excess measurement from TOF-ICR resonances, and frequency ratios using ISOLTRAP Penning-trap at ISOLDE-CERN.

Theoretical calculations:

[2023Ja02](#), [2021Sa52](#): calculated half-lives for cluster and 2α decays.

[2015Bh08](#): theory: Q-values, $T_{1/2}$, binding energies, rms charge radii, and quadrupole deformation using relativistic mean field theory.

[2019Vi04](#): calculated mean values of the coefficients as functions of the radius parameter, assuming Fermi distribution of nuclear density; evaluated relevant coefficients for the nuclear factor of the Parity-nonconserving (PNC) amplitude in low energy atomic experiments.

[2005Dz02](#): calculated isotope shift and charge radius using relativistic Hartree-Fock method.

[1992Ch20](#): calculated well depth, quadrupole and hexadecapole deformations, level energies, static moments of inertia, oblate superdeformed minimum, prolate superdeformation features using Fermion dynamic symmetry model.

[Additional information 1](#).

[1985Po11](#): calculated $T_{1/2}$ for cluster decay.

 ^{222}Fr LevelsCross Reference (XREF) Flags

[A](#) ^{226}Ac α decay (29.37 h)

E(level)	J^π	$T_{1/2}$	XREF	Comments
0	2^-	14.2 min 3	A	$\% \beta^- = 100$ $\mu = +0.63$ 1 (1985Co24, 2019StZV) $Q = +0.51$ 4 (1985Co24, 2021StZZ) Only β^- decay was observed, thus 100% β^- is assigned. $\% \alpha < 1$ was estimated by 1950Hy20 from α systematics, but not observed. Evaluated rms charge radius $\langle r^2 \rangle^{1/2} = 5.689$ fm 18 (2013An02). Evaluated $\delta \langle r^2 \rangle (^{222}\text{Fr} - ^{212}\text{Fr}) = +1.09543$ fm ² 12 (2013An02). Measured isotopic shift = -26262 MHz 3 (1985Co24). J^π : spin from atomic-beam magnetic resonance (1978Ek02 , 1978Ek05). Parity from $\text{Log } f^{1u} t = 9.52$ 7 for β^- transition to 4^+ state in ^{222}Ra . See 1987Co19 for deduced change in the mean square charge radius relative to ^{212}Fr from their measured isomeric shift, and for calculated deformation parameter from the electric quadrupole moment. $T_{1/2}$: from 1973AfZV (14.2 min 3), 1976VaZC (14.2 min). Other measurement: 14.8 min (1950Hy20). μ, Q : atomic-beam laser spectroscopy (1985Co24). See also 1986Ek02 .