^{81}Kr ε decay (2.13×10^5 y) 1988Ax01

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. Shamsuzzoha Basunia	NDS 199,271 (2025)	1-Sep-2024

Parent: ^{81}Kr: E=0; $J^\pi=7/2^+$; $T_{1/2}=2.13\times10^5$ y *+16−26*; Q(ε)=280.9 *5*; %ε decay=100

^{81}Kr-J^π,$T_{1/2}$: from ^{81}Se Adopted Levels.

^{81}Kr-Q(ε): from 2021Wa16.

Others: 1974Ch40, 1972ScYQ, 2010Mi21, 2017Ra27, 2018Ga29.

1988Ax01: ^{81}Kr from ^{81}Rb (4.576 h) decay; Ge, NaI and proportional counters; measured I(276γ), I(Br x rays), γ-x ray coin, M/L capture ratio.

1972ScYQ, 1974Ch11: ^{81}Kr from ^{80}Kr(n,γ), enriched target. Measured with Ge(Li) and Si(Li) (1972ScYQ), or proportional counter (1974Ch40).

2017Ra27, 2018Ga29: Detection of triple coincidences of two fluorescence photons and low-energy 'shaked' electrons (cascades of Auger electrons or Auger electrons + an ejected K−electron) emitted when double K−shell vacancy is caused in rare decay processes in ^{81}Se decay. Measurements were carried out for several years at the deep-underground low-background laboratory of the Baksan Neutrino Observatory (BNO), Institute for Nuclear Research of the Russian Academy of Sciences, Neutrino, at a depth of 4900 m w.e. (water equivalent) depth. A large low-background proportional counter (LPC), filled with the krypton sample was used to detect triple coincidences of 'shaked' electrons and two fluorescence photons. In the study of ^{81}Kr ε decay, cosmogenic radioisotope ^{81}Kr with a volume activity of 0.076 *4*/minute/liter Kr was contained in the original atmospheric krypton. The source activity was ≈4 ε decays/min. Data were collected for 1167 days of live measurement. Deduced probability of K-shell vacancies per K-electron capture, produced as a result of the shake-off process.

^{81}Br Levels

E(level)†	J^π‡	$T_{1/2}$‡	Comments
0	3/2$^-$		In 2010Mi21, total intensity of K component of the radiative electron capture (REC) was measured to be 1.2×10^{-4} *1* and 1.64×10^{-4} *8* from two measurements, with an average value of 1.42×10^{-4} *22* per K capture.
275.991 *11*	5/2$^-$	9.7 ps *14*	

† From Eγ.

‡ From Adopted Levels.

ε radiations

E(decay)	E(level)	Iε†	Log *ft*	Comments
(4.9 *11*)	275.991	0.30 *2*	9.35 *15*	εL=0.69 *3*; εM+=0.31 *3* E(decay): from measured $\varepsilon_M/\varepsilon_L$=0.42 *5*, 1988Ax01 deduce E=4.7 *5* assuming capture ratios from allowed decay theory are applicable to this highly hindered first forbidden nonunique transition. Iε: from measured I(276γ)/I(Br K x ray)=0.30 *2* (1988Ax01).
(280.9 *15*)	0	99.70 *2*	10.98^{1u} *5*	εK=0.84731 *9*; εL=0.12712 *8*; εM+=0.02557 *2* Iε: 100% minus branch to 276 level (0.30% *2*). E(decay): measured εL(exp)/εK(exp)=0.146 *5* (1974Ch40); this corresponds to the theoretical ratio for Q(ε)=305 *+35−29*. 2017Ra27, 2018Ga29 report measurement of probability of K-shell vacancies per K-electron capture $P_{KK}=5.7\times10^{-5}$ *8*(stat) *4*(syst) (2017Ra27,2018Ga29), deduced from a total of 42 *7*(stat) *3*(syst) triple-coincidence events related to double-K-shell-vacancy production.

† Absolute intensity per 100 decays.

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γ(^{81}Br)

Iγ normalization: 0.00299 *20* from measured ε branching to 276 level=0.30% *2* (1988Ax01) and adopted α(276γ). This conflicts with Iγ normalization=0.036 *4* implied by measured I(276γ)/I(K x-ray, Br)=0.068 *8* (1972ScYQ), assuming fluorescence yield (Br)=0.618 *19*, K-capture to total-capture ratio=0.847, α=0.0112.

E_γ †	I_γ @	E_i(level)	J_i^π	E_f	J_f^π	Mult.‡	δ‡	α#	Comments
275.990 *11*	100	275.991	5/2−	0	3/2−	M1+E2	−0.10 *3*	0.00816 *14*	α(K)=0.00724 *13*; α(L)=0.000781 *14*; α(M)=0.0001242 *23* α(N)=1.158×10^{-5} *21*

† From 1972ScYQ.
‡ From Adopted Gammas.
# Additional information 1.
@ For absolute intensity per 100 decays, multiply by 0.00299 *20*.

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Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays