^{213}Ra IT decay (2.18 ms) 1976Ra37,1994Ne01,2006Ku26

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	M. S. Basunia	NDS 181, 475 (2022)	1-Jan-2022

Parent: ^{213}Ra: E=1770 *5*; J^{π}=(17/2$^-$); $T_{1/2}$=2.18 ms *5*; %IT decay=99.4 *4*

Others: 2004He25, 1993Ne04.

1976Ra37: The decay scheme is given as constructed by 1976Ra37. Measured $\gamma\gamma$ coin.

1994Ne01: Measured g factor for the 17/2$^-$ isomeric state using an indirect method that is the ratio of Korringa constant for two isomers is proportional to the inverse ratio of the respective g factors.

2006Ku26: ^{213}Ra isotope produced by ^{48}Ca(^{170}Er,5n), E=4.25, 4.30 MeV/nucleon, and ^{50}Ti(^{170}Er,X), 4.35 MeV/nucleon, reactions. Evaporation residues were separated in-flight with the velocity filter SHIP. Measured Eγ, Iγ, $\gamma\gamma$, ce, lifetimes using a 16-strip PIPS detector and a Ge-Clover detector placed behind the pips.

2004He25: ^{208}Pb(^{12}C,7n), E=68-136 MeV; measured prompt and delayed Eγ, Iγ, $\gamma\gamma$-coin, (recoil)γ-coin; Deduced levels, spin, parity, half-life.

1993Ne04: Determined the static-quadrupole-interaction frequency of the 17/2$^-$ isomeric state using level-mixing-spectroscopy (LEMS).

2004He25: Measured half-life of the (17/2$^-$) isomeric state.

x-rays: 1976Ra37

E(x ray)	Iγ(relative)		
85.4	4.2 *3*	Kα_2	x ray
88.5	6.2 *4*	Kα_1	x ray
100.0	2.1 *3*	Kβ_1'	x ray
103.0	0.7 *2*	Kβ_2'	x ray

^{213}Ra Levels

E(level)[†]	J^{π}	$T_{1/2}$	Comments
0.0	1/2$^-$	2.73 min *5*	J^{π},$T_{1/2}$: From Adopted Levels.
546.35 *5*	(5/2$^-$)	21.5 ps *28*	$T_{1/2}$: From Adopted Levels. J^{π}: 546.35γ E2 to 1/2$^-$ state.
1608.85 *21*	(9/2$^-$)		J^{π}: 1062.5γ (E2) to (5/2$^-$) state.
1769.72 *22*	(13/2$^-$)		J^{π}: 160.8γ E2 to (9/2$^-$) state requires (13/2$^-$), in 1976Ra37 J^{π} is given as (13/2$^-$,11/2$^-$).
1770 *5*	(17/2$^-$)	2.18 ms *5*	%α=0.6 *4* E(level): From 1770 *+5−1* (2006Ku26). Others: ≈1770 (1976Ra37), 1769 *7* can be deduced considering Eα=8467 *5* and Eα=6731 *5* (1976Ra37) from the isomeric level and g.s. ^{213}Ra α decay, respectively, to the g.s. of ^{209}Rn. J^{π}: Measured g=0.87 *5* (1994Ne01) value supports the configuration $[(\pi 1h^2_{9/2})_{8+}\otimes(\nu 3p^{-1}_{1/2})]_{17/2-}$ for which the calculated magnetic moment, 7.672 *33*, is in good agreement with the measured g value (1994Ne01). $T_{1/2}$: Weighted average of 2.1 ms *1* (1976Ra37), 2.20 ms *5* (2006Ku26), and 2.2 ms *1* (545.4γ) (2004He25) − uncertainty is the lowest input value. 2004He25 also reported two more values of 2.1 ms *1* (1061.2γ) and 2.1 ms *1* (160.4γ). All three values determined by 2004He25 from the decrease of γ-ray intensities within the 14.6 ms pause between two consecutive beam bursts. %α: 0.6 *4* (2006Ku26) and 0.6 (1976Ra37 − also ≈1).

[†] From Eγ, except where otherwise noted.

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$\gamma(^{213}Ra)$

Iγ normalization: Absolute Iγ deduced by the evaluator equating the total transition intensity for each of the 546.35, 1062.5, and 160.87 cascading γ′s to the 99.4 *4* IT decay branching. Measured Iγ used to deduced the absolute intensities is listed in the comments.

E_γ[†]	I_γ[‡&]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	α[@]	Comments
(<6)		1770	(17/2⁻)	1769.72	(13/2⁻)	[E2]		E_γ: From level scheme.
160.87 *5*	42.2 *24*	1769.72	(13/2⁻)	1608.85	(9/2⁻)	E2	1.328	α(K)exp=0.25 *2* (1976Ra37) α(K)exp=0.26 *6* (2006Ku26) α(K)=0.237 *4*; α(L)=0.802 *12*; α(M)=0.217 *3* α(N)=0.0575 *8*; α(O)=0.01227 *18*; α(P)=0.00180 *3*; α(Q)=1.314×10^{-5} *19* E_γ: Others: 160.4 *5* (2004He25), 161.2 *1* (2006Ku26). In 1976Ra37, a transition ≈161γ was shown in Fig. 7 to feed the level at 1608.85 (9/2⁻), but argued it would not depopulate the isomeric state (J^π=(17/2⁻)) as an E2 transition. Iγ(rel)=43.5 *25*: Weighted average of 46 *2* (1976Ra37) and 41 *2* (2006Ku26).
546.35 *5*	93.0 *11*	546.35	(5/2⁻)	0.0	1/2⁻	E2	0.0315	α(K)exp=0.02 *1* (1976Ra37) α(K)exp=0.024 *9* (2006Ku26) α(K)=0.0212 *3*; α(L)=0.00763 *11*; α(M)=0.00195 *3* α(N)=0.000513 *8*; α(O)=0.0001131 *16*; α(P)=1.82×10^{-5} *3*; α(Q)=7.70×10^{-7} *11* E_γ: Others: 545.4 *5* (2004He25), 546.2 *1* (2006Ku26). Iγ(rel)=100.4 *12*: Weighted average of 104 *3* (1976Ra37) and 100 *1* (2006Ku26).
1062.5 *2*	98.4 *27*	1608.85	(9/2⁻)	546.35	(5/2⁻)	(E2)	0.00802	α(K)exp=0.005 *10* (1976Ra37) α(K)exp=0.014 *9* (2006Ku26) α(K)=0.00624 *9*; α(L)=0.001342 *19*; α(M)=0.000327 *5* α(N)=8.61×10^{-5} *12*; α(O)=1.94×10^{-5} *3*; α(P)=3.27×10^{-6} *5*; α(Q)=2.11×10^{-7} *3* E_γ: Others: 1061.2 *5* (2004He25), 1062.1 *1* (2006Ku26). Iγ(rel)=99.4 *27*: Weighted average of 100 *3* (1976Ra37) and 97 *6* (2006Ku26).

[†] Measurements of 1976Ra37 (semi).
[‡] Deduced by evaluator (see normalization comments) using the Iγ(rel) listed in comments.
[#] Proposed in 1976Ra37 based on α(K)exp data.
[@] Additional information 1.
[&] Absolute intensity per 100 decays.

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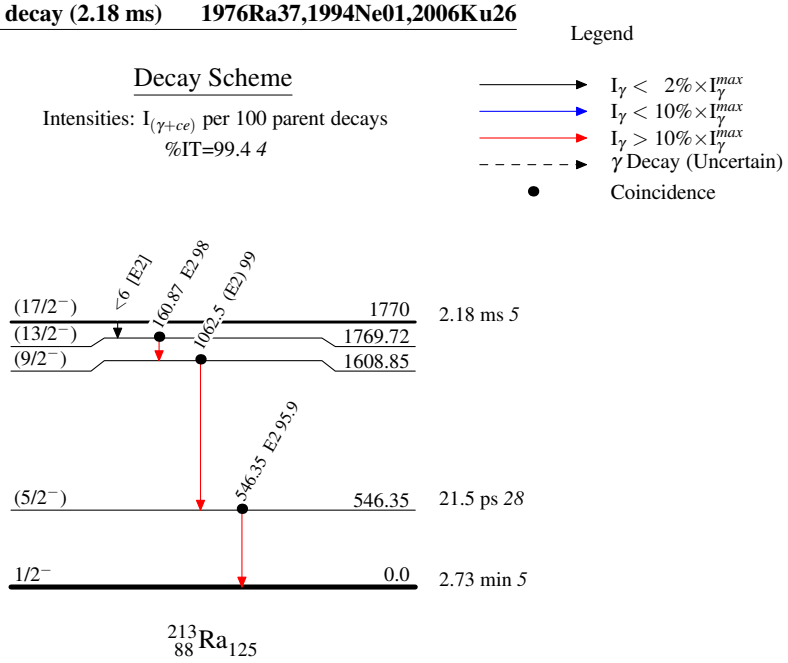
Decay Scheme

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

%IT=99.4 *4*



$^{213}_{88}Ra_{125}$