^{92}Rh ε decay (4.66 s) 2004De40,1999Zh04

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Coral M. Baglin	NDS 113, 2187 (2012)	15-Sep-2012

Parent: ^{92}Rh: E=0+x; J$^\pi$=($\geq$6$^+$); $T_{1/2}$=4.66 s *25*; Q(ε)=11302 *5*; %ε+%β^+ decay=100.0

^{92}Rh-Q(ε): From 2011AuZZ; 11050 *500* (2003Au03, from systematics).

^{92}Rh-E: whether this level is the ground state of ^{92}Rh or the isomer is not apparent according to 2004De40. Hence, the absolute energy of the state is not determined.

^{92}Rh-$T_{1/2}$: From time behaviour of the 163γ, 340γ, 818γ, and 919γ, measured using a macrocycle of a beam-on followed by a beam-off period, with on/off times tailored to suit the expected half-life of the isotope under study.

1999Zh04: source from 150 MeV ^{40}Ca bombardment of 90% enriched ^{58}Ni target, 1.125 s wide chopped beam; four HPGe detectors; measured Eγ, Iγ, $\gamma\gamma$ coin (80 ns coincidence time resolution), γ-$\gamma^\pm$ coin.

2002Ku21: source from ^{58}Ni(^{36}Ar^{10+},P_n), E=130 MeV mid-target; measured Eγ (5 transitions), $\beta^-\gamma$ coin, $T_{1/2}$(92RH).

2004De40: ^{92}Rh source produced using the ^{58}Ni(^{36}Ar^{10+},pn) reaction; E=135 MeV beam degraded to 120 MeV At target center by Ta foils to take advantage of the 368 μb reaction cross-section maximum (as calculated by HIVAP code); recoils from target were stopped and neutralized In 500 mbar of purified Ar gas inside a cell, then selectively ionized using two dye lasers tuned to the resonant atomic transitions of Rh to strongly enhance its ionization and extraction; laser-ionized nuclei guided towards LISOL mass separator by a sextupole ion guide; two HPGe detectors arranged in compact configuration around β-sensitive plastic ΔE-E detectors enclosing the tape station; measured singles and β-gated γ spectra, Eγ (E<4 MeV), Iγ, $\gamma\gamma$, $\beta\gamma$ coin, $T_{1/2}$(PARENT).

The decay scheme is that of 2004De40. Since feeding is observed to the 2675 (6$^+$) state (probably an allowed branch) and also to the 2838 (8$^+$) level, 2004De40 suggest J$^\pi$ ($\geq$6$^+$) for the 4.66 s ^{92}Rh parent. Whether this is the ^{92}Rh g.s. is unclear, but shell-model calculations (2004De40) predict E$\leq$600 keV for the first 2$^+$,4$^+$,6$^+$,8$^+$ and 9$^+$ levels; for such energies, ε decay to both the (6$^+$) 2675 and the 3015 levels appears to be allowed. However, it must be remembered that this decay scheme may be seriously incomplete (Q+≈11300, Eγ>4 MeV undetected).

^{92}Ru Levels

E(level)†	J$^\pi$‡
0.0	0$^+$
865.7 *1*	(2$^+$)
1856.8 *4*	(4$^+$)
2674.6 *4*	(6$^+$)
2775.9 *4*	
2837.7 *4*	(8$^+$)
3014.5 *4*	($\geq$5)

† From Eγ.
‡ From Adopted Levels.

ε,β^+ radiations

E(decay)	E(level)	Iβ^+ #	Iε#	Log *ft*‡	I($\varepsilon+\beta^+$)†#	Comments
(8288 *5*)	3014.5	43 *4*	0.39 *4*	5.1	43 *4*	av Eβ=3411.0 *25*; εK=0.007810 *16*; εL=0.0009514 *2*; εM+=0.0002235 *5*
(8464 *5*)	2837.7	8.2 *24*	0.070 *20*	5.9	8.3 *24*	av Eβ=3497.5 *25*; εK=0.007282 *15*; εL=0.0008870 *1*; εM+=0.0002084 *5* Log *ft*: if J$^\pi$(parent)=6$^+$, this value is unrealistically low compared with that expected for a ΔJ=2, $\Delta\pi$=No ε branch.
(8526 *5*)	2775.9	9.9 *20*	0.082 *16*	5.8	10 *2*	av Eβ=3527.7 *25*; εK=0.007109 *14*; εL=0.0008659 *1*; εM+=0.0002034 *4*
(8627 *5*)	2674.6	25 *5*	0.20 *4*	5.5	25 *5*	av Eβ=3577.3 *25*; εK=0.006837 *14*; εL=0.0008327 *1*;

Continued on next page (footnotes at end of table)

^{92}Rh ε decay (4.66 s) 2004De40,1999Zh04 (continued)

ϵ,β^+ radiations (continued)

E(decay)	E(level)	Iβ^+ #	Iε#	Log *ft*‡	I($\varepsilon+\beta^+$)†#	Comments
						εM+=0.0001956 *4*
(9445 *5*)	1856.8	14 *6*	0.08 *4*	5.9	14 *6*	av Eβ=3978.6 *25*; εK=0.005076 *9*; εL=0.0006180 *1*; εM+=0.0001452 *3* Log *ft*: value is unrealistically low for a ΔJ=2, $\Delta\pi$=No ε branch.

† $\varepsilon+\beta^+$ feeding to ground and excited states in ^{92}Ru was deduced by 2004De40 from I($\gamma^{\pm}$) after correction for contributions from other α=92 nuclides; this indicated branches to the g.s. and first 2^+ state of at least 25% and 5%, respectively, inconsistent with the meaningful branches observed to (6^+) and (8^+) states. Additionally, two half-life components were observed in the time behaviour of the 866γ. Consequently, the authors concluded that their ^{92}Rh source contained both high- and low-spin isomers and I(866γ) was apportioned between them based on the two-component fit to its time behavior. All 511γ events that could not be associated with γ events visible in the ^{92}Rh decay spectra were assigned by 2004De40 to the g.s. branch from the low-spin isomer. given the large Q+ and an inability to observe Eγ>4 MeV, a number of weak decay branches May consequently have been overlooked and the branchings deduced for the reported levels (especially the g.s. branch) will be correspondingly uncertain and are shown here for completeness alone.

‡ Values were calculated assuming decay is from ^{92}Rh g.s.; see also the general comment on I(γ+ce). 2004De40 consider them to be lower limits, At best.

Absolute intensity per 100 decays.

γ(^{92}Ru)

E$_\gamma$†	I$_\gamma$†#	E$_i$(level)	J$^\pi_i$	E$_f$	J$^\pi_f$	Mult.‡	α@
163.1 *2*	6.8 *20*	2837.7	(8^+)	2674.6	(6^+)	E2	0.225
339.9 *2*	43 *4*	3014.5	($\geq$5)	2674.6	(6^+)		
817.8 *1*	76 *9*	2674.6	(6^+)	1856.8	(4^+)	(E2)	
865.7 *1*	103 *15*	865.7	(2^+)	0.0	0^+	(E2)	
919.1 *1*	10 *2*	2775.9		1856.8	(4^+)		
991.1 *3*	100	1856.8	(4^+)	865.7	(2^+)	(E2)	

† From 2004De40.

‡ From Adopted Gammas.

Absolute intensity per 100 decays.

@ Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

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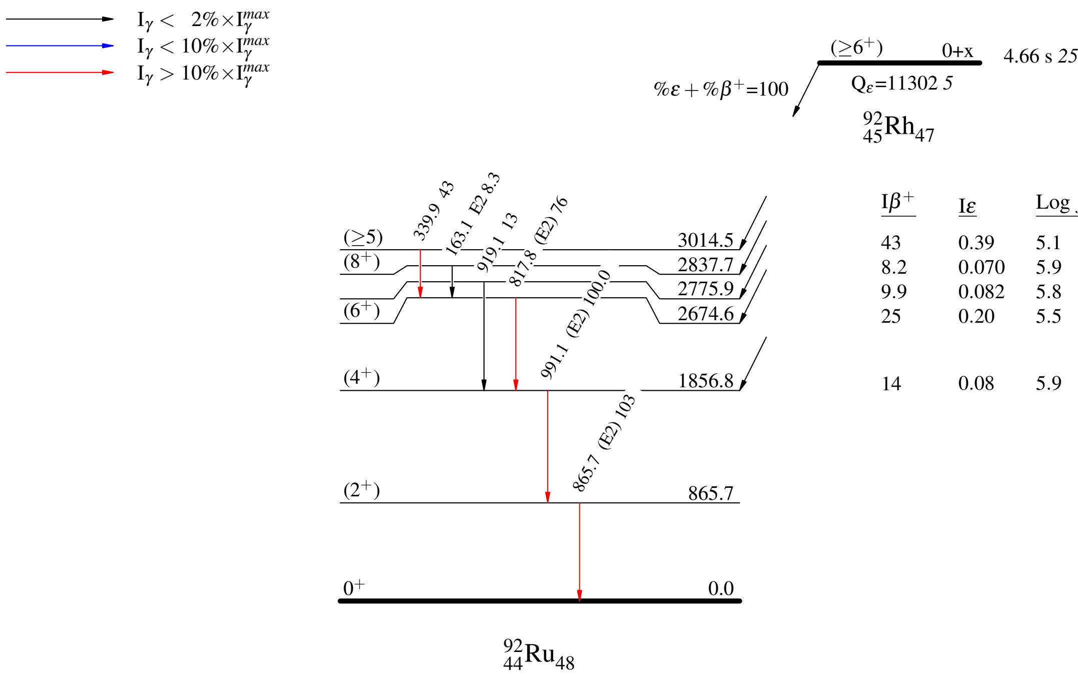
Decay Scheme

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



Iβ+	Iε	Log ft
43	0.39	5.1
8.2	0.070	5.9
9.9	0.082	5.8
25	0.20	5.5
14	0.08	5.9