^{93}Ru ε+β^+ decay (10.8 s) 1976De37

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Coral M. Baglin	NDS 112,1163 (2011)	15-Dec-2010

Parent: ^{93}Ru: E=734.4 *1*; J$^\pi$=(1/2)$^-$; $T_{1/2}$=10.8 s *3*; Q(ε)=6391 *6*; %ε+%β^+ decay=78.0 *23*

^{93}Ru-%ε+%β^+ decay: From I$\gamma\pm$=390 *50*, %εp=0.027 *5* (1983Ay01) and Iγ(^{93}Ru 734)=55.6 *26* (relative to I(1396γ)=100), assuming α(734)=0.0287 (M4 theory) and Iε/Iβ(theory).

Others: 1983Ay01, 1976DiZP, 1972Do04.

1976De37:Ge(Li) detectors; measured Eγ, Iγ, $\gamma\gamma$ coin (time resolution 50 ns).

The level scheme is from 1976De37, with the addition of the 2481p-emitting 6595 level from 1983Ay01. Note, however, that At least five more proton-emitting levels between 6.0 and 6.8 MeV are fed (weakly) by ^{93}Ru ε decay (10.8 s). In the FWHM=20 keV spectrum of fig. 1 of 1983Ay01, at least six proton groups are evident. The evaluator estimates E(p) values of 1.93, 2.07, 2.25, 2.48, 2.56 and 2.65 MeV for these, implying ^{93}Tc levels At 6.04, 6.18, 6.36, 6.59, 6.67 and 6.77 MeV, only one of which is otherwise known. 1983Ay01 mention prominent p groups At 2481 *5*, 2534 and 2557 only, and calculate E(^{93}Tc) for only the 2481p emitting level. if a 2534p exists, it is unresolved from the 2557p In fig. 1 and could hardly Be described As 'prominent', so this E(p) May contain a typographical error. In view of the uncertain E(p) data, only the level emitting the strongest P group has been ADOPTED.

^{93}Tc Levels

E(level)†	J$^\pi$‡	Comments
0	9/2$^+$	
392.65 *10*	1/2$^-$	
1408.59 *14*	(5/2$^-$)	
1503.80 *14*	1/2$^-$,3/2$^-$	
1788.87 *14*	1/2$^-$,3/2$^-$	
2431.87 *17*	(1/2,3/2)$^-$	
6595 *5*	(3/2)$^-$	E(level): from E(p)=2481 *5* for strong delayed proton group (1983Ay01) and S(p)=4086.5 *10* (2003Au03).

† From least-squares fit to Eγ, except As noted.
‡ From Adopted Levels.

ε,β^+ radiations

E(decay)	E(level)	Iβ^+ ‡	Iε‡	Log *ft*	I(ε+β^+)‡	Comments
(530 *8*)	6595		≥0.008	≤4.7	≥0.008	εK=0.8626 *2*; εL=0.1113 *1*; εM+=0.02611 *3* I(ε+β^+): 0.008% given In fig. 4 of 1983Ay01 is presumed by the evaluator to Be a lower limit since the authors give log *ft* As an upper limit. I(2481p) is significantly less than Σ[I(delayed p)]=0.027 % 5 (1983Ay01) (which would lead to log *ft*=4.1); the evaluator estimates that the E(p)=2481 proton group to ^{92}Mo(g.s.) constitutes roughly half the total delayed I(p) in the spectrum of fig. 1 in 1983Ay01.
(4694 *6*)	2431.87	11.3 *6*	0.69 *4*	4.72 *3*	12.0 *6*	av Eβ=1674.9 *29*; εK=0.05027 *24*; εL=0.00610 *3*; εM+=0.001418 *7*
(5337 *6*)	1788.87	36.7 *12*	1.39 *5*	4.526 *19*	38.1 *12*	av Eβ=1981.9 *29*; εK=0.03182 *13*; εL=0.003857 *16*; εM+=0.000897 *4*
(5622 *6*)	1503.80	23.8 *13*	0.75 *4*	4.84 *3*	24.5 *13*	av Eβ=2118.7 *29*; εK=0.02650 *10*; εL=0.003211 *12*; εM+=0.000747 *3*
(6733# *6*)	392.65	<12	<0.20	>5.6	<12†	av Eβ=2655.6 *30*; εK=0.01420 *5*; εL=0.001719 *6*; εM+=0.0003997 *1*

Continued on next page (footnotes at end of table)

^{93}Ru $\varepsilon+\beta^+$ decay (10.8 s) 1976De37 (continued)

ε,β^+ radiations (continued)

† I($\varepsilon+\beta^+$)(g.s.+393 level)=9 *25* from Iβ^+(total)=195 *25* (relative to I(1396γ)=100) and intensity imbalance for E(level)>393 assuming Iε/Iβ from theory; thus, %(Iε+Iβ^+)=3 *10* to (g.s.+393). Since decay to J$^\pi$=1/2$^-$,3/2$^-$ level at 1788 keV is allowed, decay to 9/2$^+$ g.s. is at least first forbidden unique, so (Iε+Iβ^+)(g.s.)<1.2% (from log *ft*>8.5), leaving (Iε+Iβ^+)=2% 10 for 393 level.
‡ Absolute intensity per 100 decays.
# Existence of this branch is questionable.

γ(^{93}Tc)

Iγ normalization: From I$\gamma\pm$=390 *50*, %εp=0.027 *5* (1983Ay01) and Iγ(^{93}Ru 734)=55.6 *26* (relative to I(1396γ)=100), assuming α(734)=0.0287 (M4 theory) and Iε/Iβ(theory).
1976De37 detect no additional γ rays with E$\gamma\leq$5000 and T$_{1/2}\approx$10.8 s.

E$_\gamma$†	I$_\gamma$†‡	E$_i$(level)	J$^\pi_i$	E$_f$	J$^\pi_f$	Mult.	α#	Comments
392.65 *10*		392.65	1/2$^-$	0	9/2$^+$	M4	0.325	α(K)=0.271 *4*; α(L)=0.0449 *7*; α(M)=0.00840 *12*; α(N+..)=0.001381 *20* α(N)=0.001309 *19*; α(O)=7.23×10^{-5} *11* Mult.: from Adopted Gammas.
642.9 *5*	1.2 *3*	2431.87	(1/2,3/2)$^-$	1788.87	1/2$^-$,3/2$^-$			
928.3 *2*	4.3 *4*	2431.87	(1/2,3/2)$^-$	1503.80	1/2$^-$,3/2$^-$			
1015.9 *1*	1.8 *7*	1408.59	(5/2$^-$)	392.65	1/2$^-$	[E2]	0.000798 *12*	α(K)=0.000701 *10*; α(L)=8.02×10^{-5} *12*; α(M)=1.450×10^{-5} *21*; α(N+..)=2.46×10^{-6} α(N)=2.30×10^{-6} *4*; α(O)=1.526×10^{-7} *22*
1023.0 *3*	1.8 *3*	2431.87	(1/2,3/2)$^-$	1408.59	(5/2$^-$)			
1111.2 *1*	68.0 *27*	1503.80	1/2$^-$,3/2$^-$	392.65	1/2$^-$			
1396.2 *1*	100	1788.87	1/2$^-$,3/2$^-$	392.65	1/2$^-$			
2039.1 *2*	23.9 *10*	2431.87	(1/2,3/2)$^-$	392.65	1/2$^-$			

† From 1976De37. Iγ is intensity relative to I(1396γ)=100.
‡ For absolute intensity per 100 decays, multiply by 0.385.
# 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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