^{95}Zr β^- decay 1999BeZS,1999BeZQ

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	S. K. Basu, G. Mukherjee, A. A. Sonzogni	NDS 111, 2555 (2010)	30-Jun-2009

Parent: ^{95}Zr: E=0.0; J^π=5/2$^+$; $T_{1/2}$=64.032 d *6*; Q(β^-)=1123.6 *18*; %β^- decay=100.0

1999BeZS,1999BeZQ: Evaluation by R. G. Helmer, July 1998 including some general comments from previous evaluation (1993Bu08): This evaluation was done as part of a collaboration of evaluators from Laboratoire National Henri Becquerel (LNHB) in France; Physikalisch-Technische Bundesanstalt (PTB) in Germany; HMS Sultan and AEA Technology in the United Kingdom; Khlopin Radium Institute (KRI) in Russia; Centro de Investigaciones Energeticas, Medioambientales, y Tecnologicas (CIEMAT) and Universidad Nacional a Distancia (UNED) in Spain; and Brookhaven National Laboratory (BNL), Lawrence Berkeley National Laboratory (LBNL), and Idaho National Engineering and Environmental Laboratory (INEEL) in the United States.

Measurements include: $\beta\gamma$ circular polarization, scin (1965Co18); γ's (Ge(Li)) and ce(K)'s (Si(Li)). ^{95}Zr-^{95}Nb equilibrium source (1969Br29); γ's (Ge(Li)) and β^-'s and ce(K)'s (β spect), pure ^{95}Zr, mixed ^{95}Zr and ^{95}Nb, pure 35-day Iβ normalization, and mixed 35-day and 87-h Iβ normalization sources (1974An22); see ^{95}Nb β^- decay (34.975 d) for details (1976Ho04); $\gamma(\theta)$, Ge(Li), polarized nuclei (1976Kr01); Iγ's, Ge(Li), pure ^{95}Zr and measured mixed ^{95}Zr and ^{95}Nb sources (1975De17); $\beta\gamma$(t), scin (1991De24). Others: 1969Fo01 and 1972HeYG and see 1983Lu03 for additional references.

^{95}Nb Levels

E(level)	J^π †	$T_{1/2}$ †	Comments
0.0	9/2$^+$	34.991 d *8*	
235.690 *20*	1/2$^-$	3.61 d *3*	%IT=94.4 *6*; %β^-=5.6 *6* $T_{1/2}$: from 1969Fo01, where it is given as 86.6 h *8*; other: 84 h *2* (1953Sl14), see also 1955Dr43 and several older values cited in 1953Sl14. %β^-,%IT: from ^{95}Nb Adopted Levels.
724.195 *4*	7/2$^+$	≤70# ps	
756.728 *12*	7/2$^+$‡	≤70# ps	

† From the ^{95}Nb Adopted Levels, except as noted.
‡ From $\beta\gamma$ circular polarization (1965Co18).
# From $\beta\gamma$(t) (1991De24).

β^- radiations

E(decay)	E(level)	Iβ^- †	Log *ft*	Comments
(366.9 *18*)	756.728	54.46 *22*	6.762 *8*	av Eβ=109.39 *62*
(399.4 *18*)	724.195	44.34 *22*	6.975 *7*	av Eβ=120.61 *63*
887 *3*	235.690	1.08 *7*	10.28^{1u} *3*	av Eβ=327.24 *73* Iβ^-: from Iβ(887)/ce(K)(724γ)=19 *2* (1974An22); unique first-forbidden spectral shape observed.
1120 *20*	0.0	0.103 *11*	11.21 *5*	av Eβ=405.60 *77* Iβ^-: from Iβ(887)/Iβ(1120)=11 (1974An22) and Iβ(887)=1.13 *12* and second forbidden spectral shape (1974An22).

† Absolute intensity per 100 decays.

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$\gamma(^{95}Nb)$

α(K)exp: From 1969Br29. Others: α(K)exp(235γ)=1.67 *13* and α(K)exp(724γ)=0.00123 *6* from ce(K) of 1974An22 and Iγ of 1975De17 assuming α(K)(757γ)=0.00120. See also ^{95}Nb IT decay (86.6 h).

E_γ[†]	I_γ[#]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[‡]	δ	α[@]	Comments
235.69 *2*	0.27 *2*	235.690	1/2$^-$	0.0	9/2$^+$	M4		2.79	α(K)exp=2.21 *27* α(K)=2.20; α(L)=0.440; α(M)=0.081 Iγ: Iγ(235)/Iγ(756) = 0.49 *6* from Limitation of Relative Statistical Weight, LRSW, analysis (1985ZiZY,1992Ra09) of the six values 0.34 *13* (1969Br29), 0.6 *2* (1969Fo01), 0.4 *1* (1972Er08), 0.67 *7* (H. H. Hansen et al., [1973,]Asquoted in 1975De17), 0.54 *3* (1975De17), and 0.43 *2* (1976Ho04). This analysis increases the uncertainty of the value of 1976Ho04 from 0.02 to 0.026 to reduce its relative weight from 63% to 50%. The resulting internal uncertainty is 0.019, the reduced-χ^2 is 3.2, the external uncertainty is 0.03, and the lrsw analysis expands the final uncertainty to 0.06 to include the most precise value of 0.43. Other values are 4 (1966Ts01), <0.4 (1967Br21), and 4.5 *19* (1968BoZX). Since the six values used are discrepant, one can also deal with this discrepancy by use of the RAJEVAL method (1992Ra08) which increases three of the uncertainties and gives 0.438 *19* or by the Normalized Residual method (1992Ja06) which increases two of the uncertainties and gives 0.447 *31*.
724.192 *4*	44.27 *22*	724.195	7/2$^+$	0.0	9/2$^+$	M1+E2	−0.11 *2*	0.00157	α(K)=0.00132; α(L)=0.000147 Iγ: Iγ(724)/Iγ(756)=0.814 *4* from weighted average of the following 11 values: 0.781 *24* (1965Br37), 0.81 *6* (1966Ts01), 0.776 *13* (1967Br21), 0.825 *11* (1968BoZX), 0.810 *10* (1969Br29), 0.825 *16* (1969Fo01), 0.788 *16* (1969GuZV), 0.770 *20* (1972Er08), 0.829 *5* [H. H. Hansen et al., report eur-5038e (1973)], 0.811 *3* (average of 2 values in 1975De17, and in the analysis the uncertainty was increased to 0.0037 to reduce its relative weight to 50%), and 0.789 *14* (1976Ho04). The reduced-χ^2 = 2.88 and the fit is dominated by the Hansen et al. and 1975De17 values. δ: weighted av of −0.12 *2* (1976Kr01) and −0.09 *4* (1965Co18).
756.725 *12*	54.38 *22*	756.728	7/2$^+$	0.0	9/2$^+$	M1+E2	+0.14 *5*	0.00142	α(K)exp=0.00145 *15* α(K)=0.00120; α(L)=0.000133

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$\gamma(^{95}Nb)$ (continued)

E_γ †	E_i(level)	Comments
		I_γ: from 100.0 = $I_{\gamma+ce}(756)$ + $I_{\gamma+ce}(724)$ + $I_{\beta-}(235)$ + $I_{\beta-}(0)$ with $I_{\beta-}(235)$ = 1.08 *7*, $I_{\beta-}(0)$ = 0.0010 *3*, $I_\gamma(724)/I_\gamma(756)$ = 0.814 *4*, $\alpha(724)$ = 0.00157 *4*, and $\alpha(756)$=0.00142 *3*. δ: weighted av of +0.16 *6* (1976Kr01) and +0.08 *9* (1965Co18).

† From 2000He14 for 724 γ, for 756 γ from 1978He21 scaled by 0.9999943 to 2000He14 energy scale, and from 1976Ho04 for 235 γ.

‡ From α(K)exp, $\beta\gamma$ circular polarization, and $\gamma(\theta)$.

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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