^{98}Nb β^- decay (2.86 s) 1976He10,1987Ma58

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen, Balraj Singh	NDS 164, 1 (2020)	15-Feb-2020

Parent: ^{98}Nb: E=0; J$^\pi$=1$^+$; T$_{1/2}$=2.86 s *6*; Q(β^-)=4591 *5*; %β^- decay=100.0

^{98}Nb-J$^\pi$,T$_{1/2}$: From ^{98}Nb Adopted Levels.

^{98}Nb-Q(β^-): From 2017Wa10.

1976He10: Sources of ^{98}Nb in g.s. were from the β^- decay of ^{98}Zr produced by fission of ^{235}U with thermal neutrons at Institut fur Kernchemie. γ rays were detected with Ge(Li) and NaI(Tl) detectors and β particles were detected with a β-ray proportional counter. Measured Eγ, Iγ, $\gamma\gamma$-coin, Eβ, $\beta\gamma$-coin, E(ce), I(ce), T$_{1/2}$(^{98}Nb g.s.). Deduced levels, branching ratios. Same data also appear in a thesis by one of the authors(Herzog).

1987Ma58: measured absolute intensities of 734, 787 and 1024 transitions using a mass-separated sample for A=98 nuclei from ^{235}U(n,F) reaction. No contamination from A=97 and A=99 nuclides was observed. The low temperature for the ion source further isolated ^{98}Rb only (with <5% direct ^{98}Sr). The A=97 nuclides in the sample were contributed only by delayed neutron decay (13.4%) of ^{98}Rb.

1983VaZQ: ^{98}Nb and ^{98}Y sources formed in ^{232}Th,^{238}U(α,F), E=40 MeV. Measured K-shell and L-shell conversion lines for 735, E0 transition in ^{98}Mo and 853, E0 transition in ^{98}Zr.

Other measurements:

1978St02: β, $\beta\gamma$.

1976KhZT: ce for 735 transition.

1971Fo21: ce for 735, E0 transition.

1969Hu07: γ, $\gamma\gamma$, β, $\beta\gamma$. 5 γ's reported. See also 1967Hu08, 1967Hu07, 1967Hu11 for ce, ce(t) and T$_{1/2}$(^{98}Nb g.s.).

1960Or02: T$_{1/2}$(^{98}Nb g.s.).

^{98}Mo Levels

E(level)[†]	J$^\pi$[‡]	T$_{1/2}$	Comments
0.0	0$^+$		
734.61 *10*	0$^+$	22 ns *1*	T$_{1/2}$: 735ce(t) (1967Hu07).
787.29 *21*	2$^+$		
1432.37 *23*	2$^+$		
1758.91 *22*	2$^+$		
2037.5 *7*	0$^+$		
2207.0 *4*	2$^+$		
2608.3 *7*	0$^+$		

† From least-squares fit to Eγ data.

‡ From Adopted Levels.

β^- radiations

E(decay)	E(level)	Iβ^-[†‡]	Log *ft*	Comments
(1983 *5*)	2608.3	0.33 *14*	5.4 *2*	av Eβ=786.7 *24*
(2384 *5*)	2207.0	1.7 *3*	5.0 *1*	av Eβ=972.1 *24*
(2554 *5*)	2037.5	0.88 *17*	5.4 *1*	av Eβ=1051.2 *24*
(2832 *5*)	1758.91	10.3 *11*	4.56 *5*	av Eβ=1181.9 *24* E(decay): 2760 *200* (1978St02) from β(1024γ) coin.
(3159 *5*)	1432.37	6.6 *9*	5.0 *1*	av Eβ=1336.1 *24* E(decay): 3180 *200* from β(1432γ) coin (1978St02).
(3804 *5*)	787.29	3.5 *7*	5.6 *1*	av Eβ=1642.7 *24*
(3856 *5*)	734.61	20 *4*	4.8 *1*	av Eβ=1667.9 *24*
(4591 *5*)	0.0	57 *6*	4.72 *5*	av Eβ=2019.1 *24* E(decay): 4580 *120* (1978St02), 4800 *200* (1976He10).

Continued on next page (footnotes at end of table)

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β^- radiations (continued)

† From γ+ce intensity balance at each level.
‡ Absolute intensity per 100 decays.

γ(^{98}Mo)

Iγ normalization: from Iγ(absolute)(787γ)=13 *1* (1987Ma58). Other measurements give Iγ(absolute)=3.2 *5* (1976He10), 4.0 *20* (1969Hu07). See general comment on Iγ for details of different measurements.

E_γ †	I_γ †#	E_i(level)	J^π_i	E_f	J^π_f	Mult. ‡	δ ‡	α @	$I_{(\gamma+ce)}$ #	Comments
326.7 *6*	2.4 *4*	1758.91	2^+	1432.37	2^+	(M1(+E2))	−0.17 *22*	0.0111 *8*		α(K)=0.0097 *7*; α(L)=0.00112 *10*; α(M)=0.000201 *17* α(N)=3.05×10^{-5} *25*; α(O)=1.71×10^{-6} *10*
645.1 *3*	26 *3*	1432.37	2^+	787.29	2^+	E2+M1	+1.69 *16*	0.00475 *23*		
(697.4)	1.3	1432.37	2^+	734.61	0^+	(E2)				
734.6 *1*		734.61	0^+	0.0	0^+	E0			200 *35*	ce(K)/(γ+ce)=0.843 E_γ: from level energy difference. Mult.: no corresponding γ ray seen in ce data. $I_{(\gamma+ce)}$: from I(γ+ce)(absolute)(735)=26 *4* determined from ce(854 E0 in ^{98}Zr)/ce(735 E0 in ^{98}Mo)=0.56 *6* (1983VaZJ) and absolute intensity I(γ+ce)=14.4 *14* of 854 transition in ^{98}Zr (see ^{98}Y β^- decay: 0.548 s). 1987Ma58 deduced a value of 26 *6* using I(γ+ce)(854)=15 *3*. Other %I(γ+ce) measurements: 5.5 *11* (1976He10), 6 *2* (1967Hu07). ce(854)/ce(735)=0.40 in 1971Fo21 gives absolute I(γ+ce)≈30 (as deduced by 1976He10). Others: ce(854)/ce(735)=0.36 *6*, 0.47 *5* in two different reactions (1983VaZQ) is consistent with that from 1987Ma58 and 1971Fo21. See general comment on Iγ for details of these measurements.
787.4 *3*	100	787.29	2^+	0.0	0^+	E2				I_γ: absolute Iγ=13 *1* (1987Ma58). Others: 3.2 *5* (1976He10), 4.0 *20* (1969Hu07). See also general comment on Iγ.
971.7 *3*	25 *3*	1758.91	2^+	787.29	2^+	M1+E2	−0.97 *14*			
1024.3 *3*	47 *5*	1758.91	2^+	734.61	0^+	E2				I_γ: from Iγ(1024γ)/Iγ(787γ)=6.1 *6*/13 *1* (1987Ma58). Other: Iγ=50 *6* (1976He10).
1250.2 *6*	6.8 *12*	2037.5	0^+	787.29	2^+	(E2)				
1419.7 *3*	12.8 *20*	2207.0	2^+	787.29	2^+	M1+E2	−0.33 *11*			
1432.4 *3*	26 *4*	1432.37	2^+	0.0	0^+	E2				
1758.4 *6*	5.0 *10*	1758.91	2^+	0.0	0^+	[E2]				
1821.0 *6*	2.5 *10*	2608.3	0^+	787.29	2^+	(E2)				E_γ,I_γ: from $\gamma\gamma$ only (1976He10).

† From 1976He10, unless otherwise noted. Relative intensities are from ^{98}Zr-^{98}Nb equilibrium mixture. The absolute intensities of 734 and 787 transitions have been measured by 1987Ma58, 1976He10 and 1967Hu07 using different methods. In 1987Ma58, data for 735 and 787 transitions were normalized to 854 (an E0 transition in ^{98}Zr from ^{98}Y decay) and 743 transition (in ^{97}Nb from ^{97}Zr and ^{97}Nb IT decay with Iγ(absolute)=94.75% *30*), respectively. 1976He10 normalized intensity of 787γ to 743γ (in ^{97}Nb from ^{97}Zr and ^{97}Nb IT decay). The absolute intensity of 735 transition was determined from Ice(735) and integrated β spectrum for ^{98}Nb. 1969Hu07 measured absolute intensities of both transitions with β and γ detectors of calibrated efficiencies. The results from

$\gamma(^{98}Mo)$ (continued)

1987Ma58 are considered more reliable but differ by a factor of ≈4 from those by 1976He10 and 1969Hu07. The ratio Ice(854,E0 in ^{98}Zr from ^{98}Y decay)/Ice(735, E0 in ^{98}Mo from ^{98}Nb decay) were also measured by 1983VaZQ in ^{232}Th(α,F) and ^{238}U(α,F) reactions, and by 1971Fo21 from fission of ^{235}U and ^{239}Pu.

‡ From Adopted Gammas.

For absolute intensity per 100 decays, multiply by 0.13 *1*.

@ 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.

$^{98}_{42}$Mo$_{56}$-4

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