^{78}Cu β^- decay (335 ms) 2008Wi01,2005Va19

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Ameenah R. Farhan, Balraj Singh	NDS 110, 1917 (2009)	30-Jun-2009

Parent: ^{78}Cu: E=0.0; J^π=(4$^-$,5$^-$,6$^-$); $T_{1/2}$=335 ms *11*; Q(β^-)=12.99×10^3 *50*; %β^- decay=100.0

^{78}Cu-Q(β^-): from 2009AuZZ. Other: 10150 *420* (syst,2003Au03).

^{78}Cu-J^π: 2008Wi01 propose (4$^-$,5$^-$) based on β feeding to levels and possible configuration=$\pi p^1_{3/2}\otimes\nu g^{-1}_{9/2}$, J^π=4$^-$,5$^-$ predicted by shell-model predictions. However, $\pi f_{5/2}$ orbital may also be contributing to the structure of this state. 2009Gr06 suggest (6$^-$), possibly based on β feeding of 6$^+$ and 8$^+$ states.

^{78}Cu-$T_{1/2}$: From timing of delayed neutrons. Weighted average of 342 ms *11* (1991Kr15) and 323 ms *+11−19* (2005Ho08). Others: 290 ms *100* (2005Va19), 250 ms *90* (from timing of 737γ,1987LuZX), 342 ms (2009Gr06).

^{78}Cu-%β^- decay: %β^-n=65 *8* (2009Wi03). Other:≥65 *20* (2005Va19), estimated from intensity of 114.9γ assigned to ^{77}Zn from ^{78}Cu β^-n decay.

2008Wi01: ^{78}Cu isotope produced in the reaction ^{238}U(p,X) with a 50 MeV beam provided by the HRIBF facility at ORNL′s RIB facility. The radioactive beams were extracted and mass separated. Detected decay products with a Micro-channel plate detector, a mini-ionization chamber and a moving tape collector. Measured β decays with two plastic β-detectors and γ-rays with four clover Germanium detectors. See also C.J. Gross et al., Acta Phys Pol B 40, 447 (2009).

2005Va19 (also 2002VaZX thesis): production of ^{78}Cu by ^{238}U(n,F) and ^{238}U(p,F) At ISOLDE facility. Measured Eγ, Iγ, $\gamma\gamma$, $\beta\gamma$, timing of $\beta\gamma$ and $\gamma\gamma$ coin spectra.

1987LuZX: mass-separated source produced by fission, measured γ and half-life.

The decay scheme is not known well, thus no normalization, log *ft* and decay energy (from RADLIST) are attempted.

^{78}Zn Levels

E(level)†	J^π‡	Comments
0.0	0$^+$	
730.4 *3*	2$^+$	
1621.1 *4*	(4$^+$)	
2527.8 *9*	(6$^+$)	
2672.8?	(8$^+$)	E(level): from 2009Gr06 only, treated as tentative by the evaluators.
3106		E(level): from 2008Wi01 (also 2009Gr06) only. J^π: 2009Gr06 propose (5$^-$,6$^-$,7$^-$).
≥7000		%n> 65 *20*; %γ<35% 20. E(level): from 2005Va19 only, probable group of several levels near 7 MeV.

† From Eγ′s.

‡ From ‘Adopted Levels’.

β^- radiations

E(decay)	E(level)	Iβ^-†‡	Comments
(6.0×10^3 *5*)	≥7000	≈100	Iβ^-: from 2005Va19, but 2008Wi01 propose feeding to two lower levels.
(9.9×10^3 *5*)	3106	≈35	
(1.14×10^4 *5*)	1621.1	≈65	

† From 2008Wi01 for 1621 and 3106 levels and from 2005Va19 for for group of levels near 7000. All these feedings are treated as tentative by the evaluators.

‡ Absolute intensity per 100 decays.

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$\gamma(^{78}Zn)$

1987LuZX report 216-, 524- and 737-keV γ rays from the decay of ^{78}Cu. The 737γ may be the same as 730.4 from 2005Va19. The other two γ rays are not reported by 2005Va19.

E_γ	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Comments
145[‡@]		2672.8?	(8^+)	2527.8	(6^+)	
576		3106		2527.8	(6^+)	E_γ: from 2008Wi01 (also 2009Gr06).
730.4[†] *3*	54 *33*	730.4	2^+	0.0	0^+	
890.7[†] *3*	56 *44*	1621.1	(4^+)	730.4	2^+	
908.3	<20	2527.8	(6^+)	1621.1	(4^+)	E_γ,I_γ: 2005Va19 did not observe this γ ray in the decay of ^{78}Cu, only an upper limit of 20 *7* is given for 908.3γ known from IT decay (2000Da07). However, 2008Wi01 and 2009Gr06 seem to observe a 910-keV γ ray as implied in their level scheme figures.

[†] From 2005Va19. The ordering of 890.7-730.4 cascade is not established, but the authors quote an unpublished Coulomb excitation work by P. Mayet et al (reference 29 in 2005Va19) which establishes 730γ from the first 2^+ level.
[‡] From 2009Gr06 only, treated as tentative by the evaluators.
[#] Relative to 100 for 114.9γ in ^{77}Zn populated by delayed-neutron decay of ^{78}Cu. Values are from 2005Va19.
[@] Placement of transition in the level scheme is uncertain.

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