^{68}Se ε decay 1994Ba50

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. A. Mccutchan	NDS 113, 1735 (2012)	1-Mar-2012

Parent: ^{68}Se: E=0; J$^{\pi}$=0$^+$; T$_{1/2}$=35.5 s *7*; Q(ε)=4705 *2*; %ε+%β^+ decay=100.0

^{68}Se parent from Zr(p,X), E(p)=600 MeV followed by mass separation by the ISOLDE facility. Measured Eγ, Iγ, ce, $\beta\gamma$ and $\gamma\gamma$ coincidences, and T$_{1/2}$ using a 4π β counter, a 2% Ge(Li) detector, 2 Ge detectors (33% and 70%) and a cooled Si detector.

The evaluator considers this decay scheme to be incomplete based on the large Q(ε) value of 4.7 MeV and the highest observed state at 426 keV. Thus, the I(ε+β^+)′s should be taken as upper limits and the log *ft*′s as lower limits.

1994Ba50 placed the 314γ-111γ cascade among the 426, 111, and ground states. In an earlier progress report by the same authors of 1994Ba50, the cascade is placed among the 426, 315, and ground states. The latter placement is supported by the observation of a 314 level in ^{40}Ca(^{32}S,3pnγ) (2005St08), ^{12}C(^{58}Ni,pnγ) (1998So23), and ^{54}Fe(^{16}O,pnγ) (1997Ba24) and thus adopted here. However, this leads to a severe intensity imbalance (−36%) for the 315 level in ^{68}Se ε decay, using the intensities given in 1994Ba50. Taking intensities derived from the adopted branching ratios (in particular for the 49.5γ) improves, but does not completely resolve this issue, with a −9% feeding to the 315 level.

Other: 2004Wo16: β-endpoint energy measurement giving Q(ε)=4710 *200*. Confirmed transitions observed by 1994Ba50, however, no level scheme given.

α: Additional information 1.

^{68}As Levels

E(level)‡	J$^{\pi}$†	T$_{1/2}$#	Comments
0.0	3$^+$	151.6† s *8*	%ε+%β^+=100
(158.06† *5*)	3$^+$		
160.81 *18*	(2$^+$)	<10 ns	
314.5 *3*	3$^+$		
353.0 *3*	1$^+$		
363.8 *3*	1$^+$		
425.85 *23*	1$^+$	107 ns *+23−16*	

† From the Adopted Levels.
‡ From a least-squares fit to Eγ′s by evaluator, except where noted.
# From delayed $\gamma\gamma$ coincidence measurement, except where noted.

ε,β^+ radiations

E(decay)	E(level)	Iβ^+ †#	Iε†#	Log *ft*	I(ε+β^+)‡#	Comments
(4279.1 *20*)	425.85	91 *4*	2.6 *1*	4.145 *21*	94 *4*	av Eβ=1475.40 *96*; εK=0.02463 *5*; εL=0.002779 *5*; εM+=0.0005302 *1* I(ε+β^+): depends strongly on mult of 73γ. Value given corresponds to M1 transition, whereas an E2 transition would result in a 112 *5*% branch.
(4341.2 *20*)	363.8	5.2 *16*	0.14 *4*	5.43 *14*	5.3 *16*	av Eβ=1504.94 *97*; εK=0.02331 *5*; εL=0.002630 *5*; εM+=0.0005018 *9*
(4352.0 *20*)	353.0	<5	<0.1	>5.5	<5	av Eβ=1510.09 *97*; εK=0.02309 *4*; εL=0.002605 *5*; εM+=0.0004970 *9* I(ε+β^+): depends strongly on mult of 73γ. Value given corresponds to a pure M1 transitions, whereas an E2 transition would result in a −14 *5*% branch.
(4544.2@ *20*)	160.81	<6	<0.1	>5.5	<6	av Eβ=1601.81 *96*; εK=0.01960 *4*; εL=0.002211 *4*; εM+=0.0004218 *7*

Continued on next page (footnotes at end of table)

^{68}Se ε decay 1994Ba50 (continued)

ε,β^+ radiations (continued)

† From I($\varepsilon+\beta^+$) and theoretical β^+/ε ratios.
‡ From I(γ+ce) imbalance at each level.
# Absolute intensity per 100 decays.
@ Existence of this branch is questionable.

γ(^{68}As)

Iγ normalization, I(γ+ce) normalization: From Σ(Iγ+ce)(to g.s.)=100% (direct ε feeding of the g.s. is not expected since ΔJ=3).

E_γ	I_γ †#	E_i(level)	J^π_i	E_f	J^π_f	Mult.‡	δ‡	α	$I_{(\gamma+ce)}$ #	Comments
49.5 *3*	0.45 *30*	363.8	1+	314.5	3+	[E2]		10.6 *3*		α(K)=8.62 *22*; α(L)=1.70 *6*; α(M)=0.256 *8*; α(N+..)=0.0154 *5* Iγ: from adopted branching ratios and Iγ(202γ)=5.9 *18*. Iγ: Other: The authors report 6.3 *10*, however, this leads to a large intensity imbalance (−36%) for the 315 level. The intensity derived from the adopted branching ratios improves, but does not resolve this issue, with a −9% feeding to the 315 level.
72.6 *5*	19 *3*	425.85	1+	353.0	1+	(M1)		0.218 *6*		α(K)=0.193 *5*; α(L)=0.0211 *5*; α(M)=0.00323 *8*; α(N+..)=0.000243 *6* Mult.: from the Adopted Levels, mult is M1,E2. From the decay scheme, the requirements that I(ε+β$^+$)≤100 and ≥0 for the 425 and 353 levels, leads to δ(73γ)≤1.0 and ≤1.5, respectively. The evaluator adopts mult=M1, which gives Σ I(ε+β$^+$)≈100%.
111.4 *2*	100	425.85	1+	314.5	3+	E2		0.527 *9*		α(K)=0.458 *8*; α(L)=0.0592 *10*; α(M)=0.00894 *14*; α(N+..)=0.000611 *10* α(exp)=0.43 *10* from I(ceK)/Iγ. Mult.: from α(exp).
(155.1‡ *1*)	20 *3*	314.5	3+	158.06?	3+	(M1+E2)	−0.07 *2*	0.0284 *6*		α(K)=0.0253 *5*; α(L)=0.00271 *6*; α(M)=0.000414 *9*; α(N+..)=3.13×10^{-5} *7* Iγ: from adopted branching ratios and Iγ(315γ)=113 *7* (evaluator).
158.1‡ *1*	21 *3*	(158.06)	3+	0.0	3+	M1+E2	−1.3 *+5−16*	0.10 *3*	23 *3*	α(K)=0.09 *3*; α(L)=0.010 *4*; α(M)=0.0016 *5*; α(N+..)=0.00011 *4* $I_{(\gamma+ce)}$: from ΣIγ(1+α)(to 158) (evaluator). Iγ: from I(γ+ce) and α (evaluator).
160.8 *2*	81 *4*	160.81	(2+)	0.0	3+	(M1+E2)	−1.49 *30*	0.100 *12*		α(K)=0.088 *10*; α(L)=0.0104 *12*; α(M)=0.00157 *19*; α(N+..)=0.000112 *13*
192.2 *5*	19.8 *23*	353.0	1+	160.81	(2+)	(M1+E2)		0.04 *3*		α(K)=0.038 *24*; α(L)=0.004 *3*; α(M)=0.0006 *5*; α(N+..)=5.E−5 *3*
202.7 *5*	5.9 *18*	363.8	1+	160.81	(2+)	(M1+E2)		0.035 *22*		α(K)=0.031 *19*; α(L)=0.0035 *22*; α(M)=0.0005 *4*; α(N+..)=3.9×10^{-5} *24*
(205.6‡ *4*)	2.0 *5*	363.8	1+	158.06?	3+	[E2]		0.0539 *9*		α(K)=0.0476 *8*; α(L)=0.00543 *9*; α(M)=0.000824 *13*; α(N+..)=5.94×10^{-5} *10* Iγ: from adopted branching ratios and Iγ(203γ)=5.9 *18* (evaluator).

γ(^{68}As) (continued)

E_γ	I_γ †#	E_i(level)	J^π_i	E_f	J^π_f	Mult.‡	δ‡	α	Comments
265.0 *3*	47 *4*	425.85	1$^+$	160.81	(2$^+$)	[M1,E2]		0.014 *8*	α(K)=0.013 *7*; α(L)=0.0014 *8*; α(M)=0.00021 *11*; α(N+..)=1.6×10^{-5} *8*
314.5 *3*	113 *7*	314.5	3$^+$	0.0	3$^+$	M1+E2	−0.067 *15*	0.00468 *7*	α(K)=0.00417 *6*; α(L)=0.000439 *7*; α(M)=6.70×10^{-5} *10*; α(N+..)=5.09×10^{-6} *8*
352.6 *5*	13.0 *13*	353.0	1$^+$	0.0	3$^+$	[E2]		0.00793 *12*	α(K)=0.00704 *11*; α(L)=0.000765 *12*; α(M)=0.0001163 *18*; α(N+..)=8.62×10^{-6}
426.1 *4*	13 *3*	425.85	1$^+$	0.0	3$^+$	E2		0.00423 *6*	α(K)=0.00376 *6*; α(L)=0.000404 *6*; α(M)=6.14×10^{-5} *9*; α(N+..)=4.58×10^{-6} *7*

† Relative intensity normalized to Iγ(111γ)=100.
‡ From the Adopted Gammas.
# For absolute intensity per 100 decays, multiply by 0.397 *15*.

$^{68}_{33}$As$_{35}$-4

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