^{65}Se $\varepsilon+\beta^+$ decay (34.2 ms) 2017GoZT,2011Ro47,1993Ba12

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 202,59 (2025)	25-Feb-2025

Parent: ^{65}Se: E=0.0; $J^\pi=(3/2^-)$; $T_{1/2}$=34.2 ms *7*; Q($\varepsilon+\beta^+$)=13920 *syst*; %$\varepsilon+\beta^+$ decay=100

^{65}Se-$T_{1/2}$: From 2017GoZT, adopted in Adopted Levels of ^{65}Se. Other: 33 ms *4* (2011Ro47), 9.6 ms *+5.3−4.1* (1995Hu24).

^{65}Se-Q($\varepsilon+\beta^+$): 13920 *310* (syst,2021Wa16). Other: 13579 *165*, deduced by 2011Ro47 from their estimated mass excess of ^{65}Se.

2017GoZT (thesis; also 2020Gi02): ^{65}Se was produced in the fragmentation of a 350 MeV/nucleon ^{78}Kr beam at RIKEN. Fragments were identified and selected by the BigRIPS and the ZDS separators, and implanted into the WAS3ABi device consisting of 3 DSSSDs, surrounded by the EURICA array of Ge detectors for γ-ray detection. Measured E(p), I(p), implant-decay time correlations, Eγ. Deduced $T_{1/2}$, branching ratios. All details are from 2017GoZT. 2020Gi02 only report the same $T_{1/2}$.

2011Ro47 (also 2014Ro14,2011RoZZ): ^{65}Se was produced in the fragmentation of ^{78}Kr on a Ni target with E(^{78}Kr)=70 MeV/nucleon at GANIL. Fragments were selected with the α-LISE3 separator, identified by ToF and ΔE, and implanted into a detector system consisting of four silicon detectors: ΔE, degrader, DSSD, and Si(Li). γ rays were detected with four HPGe Clover detectors. Measured E(p), I(p), Eβ, Eγ, implant-β time correlation. Deduced parent $T_{1/2}$, decay branching ratio.

1993Ba12: ^{65}Se was produced via ^{40}Ca(^{28}Si,3n) reaction with 175 MeV ^{28}Si from the 88-inch cyclotron at LBNL. Charged particles were detected with a ΔE-E detector telescope. Measured E(p), I(p). Deduced decay branching ratio. Similar previous efforts by 1987Ho01, 1978ViZT were unsuccessful.

1995Hu24: ^{65}Se was produced in the ^{40}Ca(^{28}Si,3n) reaction at IMP, Lanzhou. Charged particles were detected with a telescope of ΔE and E detectors. Measured E(p), I(p), decay curve. Deduced parent $T_{1/2}$, decay branching ratio.

The decay scheme is incomplete.

^{65}As Levels

E(level)	J^π[†]	$T_{1/2}$[†]	Comments
0.0	$(3/2^-)$	130.3 ms *6*	
3310 *45*	$(3/2^-)$		%p=100 Isobaric Analog State of ^{65}Se g.s. Two proton groups are observed to depopulate the IAS in ^{65}As from the decay of ^{65}Se: E(p0)(c.m.)=3523 *16* to ^{64}Ge g.s. with %I(p0)=44 *2* and E(p1)(c.m.)=2638 *15* to 901, 2^+ level in ^{64}Ge with %I(p1)=18 *2*, seen by 2017GoZT in coincidence with a γ of E=901.1 *3* (not seen in 2011Ro47 due to low statistics). E(level): weighted average of 3302 *45* from E(p0)(c.m.)=3523 *16* and 3318 *45* from E(p1)(c.m.)=2638 *15*, both with adopted S(p)=−221 *42* from Adopted Levels (−90 *80* from 2021Wa16). Others: 3453 *82* (2017GoZT, using E(p0) only); 3420 *87* (2011Ro47, using ^{65}As mass in 2011Tu02); 3680 (1995Hu24, using a S(p)=−81 keV), 3250 (1993Ba12, using a predicted S(p)=−360 keV). E(p0)(c.m.)=3523 *16* is weighted average of 3532 *16* (2017GoZT) and 3510 *20* (2011Ro47), in the center of mass (c.m.) frame. Others: E(p0)(lab)=3550 *30* (1993Ba12), 3700 *80* (1995Hu24), in the lab frame. 2011Ro47 also observed a weaker proton peak at 3700 *30*, but didn′t associate it with any decay branch. E(p1)(c.m.)=2638 *15* is weighted average of 2642 *15* (2017GoZT) and 2620 *30* (2011Ro47). Note that only 1993Ba12 explicitly state that E(p) is given in the laboratory frame. The evaluator has determined E(p) values in 1995Hu24 are in the laboratory frame and values in 2017GoZT and 2011Ro47 are in the center of mass frame, simply based on comparisons of their reported energies of the IAS in ^{65}As with their E(p) values used to calculate the IAS energies.

[†] From Adopted Levels.

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ε,β^+ radiations

E(decay)	E(level)	Iβ^+ †	Iε†	Log *ft*	I($\varepsilon+\beta^+$)†	Comments
(10610 *syst*)	3310	61.9	0.084	3.5	62 *3*	av Eβ=4.48×10^3 *16*; εK=0.00120 *13*; εL=1.32×10^{-4} *14*; εM+=2.44×10^{-5} *23* I($\varepsilon+\beta^+$): Estimated from the sum of %I(p0 to ^{64}Ge g.s.)=44 *2* and %I(p1 to 901 level in ^{64}Ge)=18 *2* in 2017GoZT. Others: 52 *18* from 2011Ro47, estimated from their %I(p0+p1)=62 *13* with correction for proton efficiency; ≈21 (1995Hu24, based on I(p) of E(p)(lab)=3700 *80* proton group); ≈60 (1993Ba12, based on I(p) of E(p)(lab)=3550 *30* proton group).

† Absolute intensity per 100 decays.