Adopted Levels, Gammas

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

Q(β^-)=−13920 *syst*; S(n)=15.17×10^3 *12*; S(p)=−221 *42*; Q(α)=−2063 *47* 2021Wa16

ΔQ(β^-)=310 (syst,2021Wa16).

S(n),S(p),Q(α): Deduced by the evaluator using mass excesses of −46806 *42* for ^{65}As, −39710 *110* for ^{64}As, and −47168 *21* for ^{61}Ga measured by 2023Wa10, and −54316 *4* for ^{64}Ge from 2021Wa16. Values from 2021Wa16: S(n)=15480 *220* (syst), S(p)=−90 *80*, Q(α)=−2230 *90*.

S(2p)=4837 *42*, Q(ε)=9672 *42*, Q(εp)=4738 *42*, from mass excesses of ^{65}As measured by 2022Si20, and −56547.1 *13* for ^{63}Ga, −56478.2 *22* for ^{65}Ge, and −58832.8 *14* for ^{64}Ge from 2021Wa16. Values from 2021Wa16: S(2p)=4970 *80*, Q(ε)=9540 *80*, Q(εp)=4610 *80*.

S(2n)=29580 *220* (syst).

Mass measurements: 2023Wa10 (M.E.=−46806 *42*), 2011Tu02 (M.E.=−46937 *85*).

2023Wa10: ^{65}As was produced in ^{9}Be(^{78}Kr,X) with E=460 MeV/nucleon ^{78}Kr beam from the accelerator at the Heavy Ion Research Facility in Lanzhou (HIRFL). Fragments were separated by the RIBLL2 separator and injected into the experimental cooler storage ring (CSRe). Measured time-of-flight. Deduced mass excess.

2017GoZT (thesis; also 2020Gi02): ^{65}As 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 $T_{1/2}$.

2011Tu02 (also 2011ZhZV): ^{9}Be(^{78}Kr,X) E=483.4 MeV/nucleon at HIRFL. Measured time-of-flight. Deduced mass excess.

Additional information 1.

2014Ro14: ^{65}As was produced in the fragmentation of 70 MeV/nucleon ^{78}Kr beam with Ni target at GANIL. Fragments were selected with the LISE3 separator and identified by time-of-flight and energy loss. Measured half-life of ^{65}As ground-state decay by (fragment)β, (fragment)γ correlations using set of four Si detectors (an energy loss ΔE detector, a degrade, DSSD and Si(Li)) for particles surrounded by four HPGe Clover detectors, three EXOGAM and one mini-clover Ge detector for γ rays.

2002Lo13,2002Bl17: ^{65}As was produced by fragmentation of 73 MeV/nucleon ^{78}Kr beam at GANIL. Measured implant-β(t). Deduced $T_{1/2}$.

1993Wi03: ^{65}As was produced by fragmentation of 75 MeV/nucleon ^{78}Kr beam by an enriched ^{58}Ni target and mass separation at NSCL. Measured $T_{1/2}$.

1991Mo10: ^{65}As was produced by fragmentation of 65 MeV/nucleon ^{78}Kr beam on an enriched ^{58}Ni target at NSCL. First observation of ^{65}As as recognized in 2010Sh34 compilation of isotope discovery.

1991XuZZ: ^{65}As was produced by fragmentation of 20 MeV/nucleon ^{64}Zn beam incident on a Be target and mass separation at RIKEN; claims to be first identification of ^{65}As; no other data.

1990Ro15: search for proton radioactivity of ^{65}As was made with ^{40}Ca(^{32}S,αp2n) at E(^{32}S)=200 MeV and ^{40}Ca(^{28}Si,p2n) at E(^{28}Si)=175 MeV and mass separation at LBNL. No such activity was observed in the proton energy range of 200-700 keV. Authors conclude that ^{65}As must decay mostly by positron emission or by proton emission with $T_{1/2}$ < 100 μs.

1989Ho19: search for proton radioactivity of ^{65}As was made with ^{40}Ca(^{28}Si,p2n) at E(^{28}Si)=87 MeV and mass separation at Orsay. They looked for proton radioactivity in the energy range 250-600 keV and half-life of 10 μs to 100 ms. No such activity was observed and the authors established a lower production cross section limit of 1×10^{-6} barn.

1988HoZL, 1989HoZQ: search for proton radioactivity of ^{65}As was made with ^{40}Ca(^{28}Si,p2n) at E(^{28}Si)=140 MeV and separation of reaction products with a mass analyzer at Daresbury. No evidence was found for proton decay of ^{65}As; the authors conclude that ^{65}As decays predominantly by positron emission with a weak proton decay branch or its half-life is less than 5 μs which is below the detection capability of their equipment.

Theoretical calculations:

2022Zo01,2021Ma33,2021Kl02,2019Zo02: calculated S(p), S(2p), mass excess.

2021Qu01: calculated resonant states of ^{64}Ge(p,γ).

2017Ni16: calculated nuclear radius, single-particle energies.

2014Bh16,2012Bh10: calculated binding energy, mass, S(p).

2013Co23: calculated levels, J, π, spectroscopic quadrupole moments.

2003Mi23: calculated binding energy, quadrupole deformation.

2001Pa02: calculated ground-state J, π, binding energy, deformation parameter, radius, S(p).

Adopted Levels, Gammas (continued)

^{65}As Levels

Cross Reference (XREF) Flags

A ^{65}Se $\varepsilon+\beta^+$ decay (34.2 ms)
B ^{9}Be(^{67}As,^{65}Asγ)

E(level)	J$^\pi$	T$_{1/2}$	XREF	Comments
0.0	(3/2$^-$)†	130.3 ms *6*	AB	%ε+%β^+=100 %ε+%β^+: no evidence of ground state proton decay was found by 1993Wi03,1989Ho19. Relativistic mean field model predict stable against p emission (2001Pa02). T$_{1/2}$: from implant-decay time correlation (2017GoZT,2020Gi02). Others: 126 ms *7* (2014Ro14), 126 ms *16* (2002Lo13,2002Bl17), 190 ms *+110−70* (1993Wi03,1993Wi18,1993Wi03). Additional information 2.
187 *3*	(5/2$^-$)†	0.27 ns *14*	B	
3310 *45*	(3/2$^-$)		A	%p=100 E(level): from ^{65}Se $\varepsilon+\beta^+$ decay, deduced from measured energies of emitted protons and adopted S(p)=−221 *42*. J$^\pi$: IAS of ^{65}Se (3/2$^-$) g.s. Decays to ^{64}Ge by proton emissions: E(p0)(c.m.)=3523 *16* to ^{64}Ge g.s. and E(p1)(c.m.)=2638 *15* to 901, 2$^+$ level in ^{64}Ge. See ^{65}Se $\varepsilon+\beta^+$ decay for more details about proton emissions.

† From calculations using D1S Gogny interactions and shell-model approach using the JUN45 interactions predict oblate-deformed shape (2011Ob02). The ordering of 3/2$^-$ and 5/2$^-$ states is tentative.

γ(^{65}As)

Additional information 3.

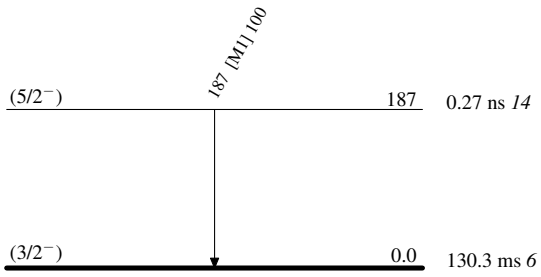
E$_i$(level)	J$_i^\pi$	E$_\gamma$	I$_\gamma$	E$_f$	J$_f^\pi$	Mult.	α†	Comments
187	(5/2$^-$)	187 *3*	100	0.0	(3/2$^-$)	[M1]	0.0171 *8*	α(K)=0.0152 *7*; α(L)=0.00162 *7*; α(M)=0.000247 *11* α(N)=1.88×10^{-5} *8* B(M1)(W.u.)=0.012 *+11−5* E$_\gamma$: from ^{9}Be(^{67}As,^{65}Asγ) (2011Ob02).

† Additional information 4.

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level



$^{65}_{33}As_{32}$