

Adopted Levels

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	C. D. Nesaraja	ENSDF	31-Mar-2015

$Q(\beta^-) = -13680$ SY; $S(n) = 15740$ SY; $S(p) = -641$ 42; $Q(\alpha) = -1600$ 90 [2012Wa38,2014De41](#)

$\Delta Q(\beta^-) = 400$, $\Delta S(n) = 310$ (syst,[2012Wa38](#)).

All values except $S(p)$ are from [2012Wa38](#).

$S(p)$: from [2014De41](#). Others: -785 keV $+34-40$ ([2011Ro18](#)) with assumption of $J^\pi(^{69}\text{Br g.s.}) = 3/2^-$. This value was symmetrized to -790 keV 40 in [2012Wa38](#). For $J^\pi(^{69}\text{Br g.s.}) = 5/2^-$, [2011Ro18](#) estimated $S(p) = -735$ keV $+58-72$.

[2011Ro18](#): ⁶⁹Br produced at the Coupled Cyclotron Facility of the National Superconducting Cyclotron Laboratory (NSCL) by a secondary beam consisting of ⁶⁹As (23.9%), ⁷⁰Se (66.7%) and ⁷¹Br (9.4%) (produced in fragmentation of ⁷⁸Kr beam at E=140 MeV/nucleon with a ⁹Be target) impinging on a polypropylene reaction target. Emitted protons were detected by the High Resolution Array (HIRA) with sixteen ΔE -E telescopes, each configured with a double-sided silicon strip detector and backed by four CsI(Tl) crystals. Heavy projectile-like residues were detected in the focal plane of the S800 spectrograph, then identified by energy loss and time of flight. Measured protons in coincidence with ⁶⁸,⁶⁹Se and ⁶⁷,⁶⁸As, ΔE , ToF, $Q(\beta^-)$ value. Deduced proton separation energy, mass excess. Monte Carlo simulation. Implications for the astrophysical rp-process.

[1996Pf01](#): Searched for ⁶⁹Br in the fragmentation of ⁷⁸Kr projectile with 75 MeV/u on a ⁵⁸Ni target. Estimated $T_{1/2}$ from the absence of ⁶⁹Br.

[1995B106](#): Found no evidence for ⁶⁹Br in the fragmentation of ⁷⁸Kr beam at 73 MeV/u on a Ni target. Deduced that ⁶⁹Br is proton unbound by at least 450 keV to yield a $T_{1/2}$ less than about 100 ns.

[1995He39](#): Attempt to measure the β^+ decay half-life of ⁶⁹Br in the fragmentation of ⁷⁸Kr at 70 MeV/u on a natural Ni target was not successful because of low count rate.

[1995MoZV](#): searched for ⁶⁹Br in the fragmentation of a 75 MeV/u ⁷⁸Kr beam incident on a ⁵⁸Ni target. No events that could be attributed to ⁶⁹Br were observed.

[1991Mo10](#): identified ⁶⁹Br activity in the fragmentation of ⁷⁸Kr beam at 65 MeV/u on an enriched ⁵⁸Ni target. However, the authors state that it is difficult to conclude from such a small number of events whether ⁶⁹Br has been in fact identified or whether the events are due to background processes.

[1990Ro15](#): searched for the g.s. p decays of ⁶⁹Br using the ⁴⁰Ca(³²S,p2n) reaction with $E(^{32}\text{S}) = 200$ MeV. No p groups that could be assigned to ⁶⁹Br were observed. If the production cross section of ⁶⁹Br is of the order of 150 microbarns, then ⁶⁹Br must have p half-life shorter than 300 μs or longer than 30 ms.

[1989Ho19](#): searched for p radioactivity of ⁶⁹Br using the ⁴⁰Ca(³²S,p2n) reaction. Found no p radioactivity in the energy range 250-600 keV and a $T_{1/2}$ range of 10 μs - 100 ms and a production cross section lower limit of 1 microbarn.

Others: [1999Ja02](#), [1997Or04](#), [1989HoZG](#), [1989HoZQ](#), [1978BaYE](#), [1977JaZT](#).

⁶⁹Br Levels

Cross Reference (XREF) Flags

A ⁶⁹Kr ϵ decay (28 ms)

<u>E(level)[†]</u>	<u>J^π[†]</u>	<u>T_{1/2}</u>	<u>XREF</u>	<u>Comments</u>
0.0	(5/2 ⁻)	<24 ns	A	%p=100 J ^π : from 2014De41 . Others: J ^π =(3/2 ⁻) in 2011Ro18 based on mirror symmetry with ⁶⁹ Se, and (1/2 ⁻) in 2011Ro47 (also in 2012Au07). T _{1/2} : from 1996Pf01 . Others: <100 ns (1995B106), ≈30 ns (1995MoZV). %p: ⁶⁹ Br g.s. is unbound towards proton emission from observation of E(p)=641 keV 42 (2014De41) proton group from the decay of ⁶⁹ Br g.s. to ⁶⁸ Se g.s. Also 2011Ro47 , in their experiment to observe beta-delayed proton emission from ⁶⁹ Br g.s. did not find any evidence of delayed proton emission activity with an upper limit of 5%. 1996Pf01 had also found unbound nature of ⁶⁹ Br g.s. based on upper limit of half-life deduced from expected cross section.
0+x	(3/2 ⁻)		A	%p=100

Continued on next page (footnotes at end of table)

Adopted Levels (continued) ${}^{69}\text{Br}$ Levels (continued)

<u>E(level)[†]</u>	<u>J^π[†]</u>	<u>XREF</u>	<u>Comments</u>
3153 55	(5/2 ⁻)	A	<p>E(level): from analysis of β delayed proton spectrum of ${}^{69}\text{Kr}$ in 2014De41 with two closely spaced states decaying by protons. The analysis of the doublet peak was supported by shell model calculations.</p> <p>%p=100 T=3/2</p> <p>E(level): from proton decay with energy of 2939 keV 22 observed in correlation with 854γ from the first 2⁺ state of ${}^{68}\text{Se}$. Isobaric analog state (IAS) of ${}^{69}\text{Kr}$ in ${}^{69}\text{Br}$.</p> <p>J^π: IAS of ${}^{69}\text{Kr}$ g.s. of proposed J^π=(5/2⁻) based on log ft=3.43 11, typical of that for superallowed β transitions.</p>

[†] Assignments from [2014De41](#) with the level ordering based on results in [2014De41](#), [2011Ro18](#), and *pf*- shell model calculation.