^{82}Ga β^-n decay 2016Al10,1980HoZN,2016Te09

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. Shamsuzzoha Basunia	NDS 199,271 (2025)	1-Sep-2024

Parent: ^{82}Ga: E=0; J^π=(2$^-$); $T_{1/2}$=0.600 s *2*; Q(β^-n)=5290 *3*; %β^-n decay=20.4 *10*

^{82}Ga-J^π,$T_{1/2}$: from Adopted Levels of ^{82}Ga (2016Te09).

^{82}Ga-Q(β^-n): from 2021Wa16.

^{82}Ga-%β^-n decay: weighted average of 22.2 *20* (2016Te09 − 22 *2* in 2017Ve01 − same work), 21.4 *22* (1980Lu04), 19.8 *10* (1986Wa17). Other: 22.2 *20* in the ^{82}Ga Adopted Levels from 2016Te09.

Others: 2017Ve01, 1986Wa17, 1980Lu04.

2016Al10: ^{82}Ga produced in the fission of $^{238}UC_x$ target (6 g/cm^2 thickness) by a 50 MeV, 10-18 μA proton beam from the Holifield Radioactive Ion beam facility (HRIBF) at Oak Ridge National Laboratory, followed by a two-step high-resolution mass separation. The radioactive ion beam was implanted on a moving tape collector (MTC) surrounded by four HPGe detectors for γ rays and two plastic scintillators for β detection. The counting cycle was four seconds implantation of ion beam on the tape, followed by two seconds of decay measurement. Measured Eγ, Iγ, $\beta\gamma$-coin, $\gamma\gamma$-coin. Deduced level scheme of ^{81}Ge, and J^π.

1980HoZN: Source: from mass-separated fission products. Singles γ and $\gamma\gamma$-coincidences measured with Ge(Li); x-ray detector for low energy γ search (E$\gamma\geq$15 keV); Si(Li) detector for simultaneous measurement of ce and γ spectra for α(K)exp determination.

2016Te09: ^{82}Ga beam, E=30 keV, was produced in photofission of ^{238}U using UC_x pellets containing about 60 g of ^{238}U. Mass-separated ^{82}Ga beam was then sent to β-decay counting station BEDO where it was collected on mylar tape at the center of the detection system of 4π ^{3}He neutron counter TETRA, an HPGe detector for γ radiation and plastic 4$\pi\beta$ array for electrons. Measured Eγ, Iγ, β spectrum, β-gated γ and β(neutron)-gated γ spectra, delayed neutrons, %β^-n, and half-life of ^{82}Ga decay for 1700 counting cycles in beam-off and beam-on collection/counting steps. See also 2017Ve01.

^{81}Ge Levels

E(level)[†]	J^π[‡]	$T_{1/2}$[‡]	Comments
0	(9/2$^+$)	6.4 s *2*	
679.14 *4*	(1/2$^+$)	7.6 s *6*	E(level): from Adopted Levels.
711.09 *14*	(5/2$^+$)	3.9 ns *2*	
895.4 *5*	(1/2$^-$)	<0.5 ns	
1241.3 *4*	(1/2$^+$,3/2,5/2$^+$)		
1286.8 *6*	(5/2$^+$,7/2$^-$)		
1723.8 *4*	(3/2$^-$,5/2$^-$)		
1730.4 *7*	(5/2$^+$,7/2)		
1831.9 *6*	(3/2$^-$,5/2$^-$)		
2548.3 *7*	(5/2$^+$,7/2)		
2996.3 *12*	(3/2$^-$,5/2$^-$,7/2$^-$)		
3437.0 *6*	(3/2$^-$,5/2$^-$)		

[†] From a least-squares fit to Eγ.

[‡] From Adopted Levels.

^{82}Ga β^-n decay 2016Al10,1980HoZN,2016Te09 (continued)

$\gamma(^{81}Ge)$

E_γ[†]	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α[&]	Comments
216.48 *7*	6.5 *7*	895.4	(1/2$^-$)	679.14	(1/2$^+$)	E1	0.00692	α(K)=0.00619 *9*; α(L)=0.000635 *9*; α(M)=9.43×10^{-5} *14*; α(N+..)=6.01×10^{-6} *9* α(N)=6.01×10^{-6} *9* E$_\gamma$: weighted average of 216.46 *7* (1980HoZN), 216.4 *4* (2016Al10), and 216.9 *3* (2016Te09). I$_\gamma$: weighted average of 6.5 *6* (1980HoZN), 8.2 *9* (2016Al10), and 5.6 *7* (with respect to Iγ(711)=17 *1*, otherwise 33 I4 if Iγ(711)=100 *48* − 2016Te09 − other: 6.8 *34* from 40 *20*).
482.6[‡] *3*	0.4[@] *1*	1723.8	(3/2$^-$,5/2$^-$)	1241.3	(1/2$^+$,3/2,5/2$^+$)			
530.3 *3*	2.3 *10*	1241.3	(1/2$^+$,3/2,5/2$^+$)	711.09	(5/2$^+$)			E$_\gamma$: weighted average of 530.2 *3* (1980HoZN), 530.0 *5* (2016Al10), and 530.5 *4* (2016Te09). I$_\gamma$: unweighted average of 2.3 *8* (1980HoZN), 0.6 *1* (2016Al10), and 4.1 *7* (with respect to Iγ(711)=17 *1*, otherwise 34 I4 if Iγ(711)=100 *48* − 2016Te09 − other: 4.6 *24* from 27 *14*).
562.6[‡] *4*	0.7 *2*	1241.3	(1/2$^+$,3/2,5/2$^+$)	679.14	(1/2$^+$)			E$_\gamma$: weighted average of 562.4 *5* (2016Al10) and 562.8 *4* (2016Te09). I$_\gamma$: Weighted average of 0.6 *2* (2016Al10) and 1.0 *3* (with respect to Iγ(711)=17 *1*, otherwise 6 *2* if Iγ(711)=100 *48* − 2016Te09).
711.09 *14*	15.6 *14*	711.09	(5/2$^+$)	0	(9/2$^+$)	[E2]	8.42×10^{-4}	α(K)=0.000752 *11*; α(L)=7.79×10^{-5} *11*; α(M)=1.162×10^{-5} *17*; α(N+..)=7.51×10^{-7} *11* α(N)=7.51×10^{-7} *11* E$_\gamma$: weighted average of 711.05 *14* (1980HoZN), 711.1 *5* (2016Al10), and 711.4 *4* (2016Te09). I$_\gamma$: weighted average of 16.0 *17* (1980HoZN), 12.4 *14* (2016Al10), and 17 *1* (2016Te09).
828.2[‡] *4*	1.8 *5*	1723.8	(3/2$^-$,5/2$^-$)	895.4	(1/2$^-$)			E$_\gamma$: weighted average of 828.1 *5* (2016Al10) and 828.3 *4* (2016Te09). I$_\gamma$: Weighted average of 2.1 *3* (2016Al10) and 1.0 *5* (with respect to Iγ(711)=17 *1*, otherwise 6 *3* if Iγ(711)=100 *48* − 2016Te09).
936.5[‡] *4*	0.7 *2*	1831.9	(3/2$^-$,5/2$^-$)	895.4	(1/2$^-$)			E$_\gamma$: weighted average of 936.4 *5* (2016Al10) and 936.6 *4* (2016Te09). I$_\gamma$: Weighted average of 0.7 *2* (2016Al10) and 0.7 *3* (with respect to Iγ(711)=17 *1*, otherwise 4 *2* if Iγ(711)=100 *48* − 2016Te09).
1019.3[‡] *6*	0.8[@] *3*	1730.4	(5/2$^+$,7/2)	711.09	(5/2$^+$)			

$^{81}_{32}Ge_{49}$-2

^{82}Ga β^-n decay 2016Al10,1980HoZN,2016Te09 (continued)

$\gamma(^{81}Ge)$ (continued)

E_γ †	I_γ #	E_i(level)	J_i^π	E_f	J_f^π	Comments
1272.5‡ *11*	0.6@ *2*	2996.3	(3/2$^-$,5/2$^-$,7/2$^-$)	1723.8	(3/2$^-$,5/2$^-$)	
1286.8‡ *6*	1.9 *4*	1286.8	(5/2$^+$,7/2$^-$)	0	(9/2$^+$)	E_γ: weighted average of 1287.7 *8* (2016Al10) and 1286.4 *5* (2016Te09). I_γ: weighted average of 1.8 *4* (2016Al10) and 2.5 *10* (with respect to Iγ(711)=17 *1*, otherwise 15 *6* if Iγ(711)=100 *48* – (2016Te09)).
1713.4‡ *5*	0.3@ *1*	3437.0	(3/2$^-$,5/2$^-$)	1723.8	(3/2$^-$,5/2$^-$)	
2548.3‡ *7*	1.5@ *4*	2548.3	(5/2$^+$,7/2)	0	(9/2$^+$)	
2725.0‡ *10*	0.7@ *2*	3437.0	(3/2$^-$,5/2$^-$)	711.09	(5/2$^+$)	

† From 2016Al10, except where otherwise noted.
‡ The γ seen by 2016Al10 in ^{82}Ga β^-n decay; known earlier in literature from ^{81}Ga β^- decay.
# Photon intensity relative to Iγ(1348.07)(^{82}Ge)=100 *4*.
@ From 2016Al10.
& Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

$^{81}_{32}Ge_{49}$-3

^{82}Ga β^-n decay 2016Al10,1980HoZN,2016Te09

Decay Scheme

Intensities: Relative I_γ