^{82}Ga β^- decay 2016Te09,2016Al10

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	J. K. Tuli, E. Browne	NDS 157,260 (2019)	1-Mar-2019

Parent: ^{82}Ga: E=0.0; $J^\pi=(2^-)$; $T_{1/2}$=0.600 s *2*; Q(β^-)=12484 *3*; %β^- decay=100

^{82}Ga-$T_{1/2}$: From Adopted Levels. Other: Others: $T_{1/2}$=0.599 s *2* (2016Al10); 0.604 s *11*, from growth curve for (delayed) neutron activity assigned purely to ^{82}Ga β^-n decay (2016Te09).

^{82}Ga-Q(β^-): From 2017Wa10.

^{82}Ga-%β^- decay: %β^-=100, %β^-n=22 *2* from 2016Te09.

Based on 2016Te09, 2016Al10 in XUNDL. 2016Te09 compiled by B. Singh (McMaster), March 3, 2016; included 2017Ve01, June 23, 2017.

2016Al10 compiled by S. Kumar (Uiversity of Delhi) and B. Singh (McMaster), Oct. 8, 2018.

2016Te09: radioactive ion beam of ^{82}Ga at 30 keV was produced in photofission of ^{238}U using UC_x pellets containing ^{238}U. The photons were created by 50-MeV primary electron beam bombarding a Ta target heated up to ≈2000°C. The Ga atoms were ionized with the Resonant Ionization Laser Ion source (RILIS) using a two-step ionization system. Extracted 30 keV ion beam was delivered to PARRNe on-line separator at ALTO ISOL facility. 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.

2016Al10: ^{82}Ga produced in the fission of $^{238}UC_x$. Target of 6 g/cm^2 thickness by a 50 MeV, 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 transmitted to the Low-energy Radioactive Ion Beam Spectroscopy Station (LeRIBSS), then implanted on a moving tape collector (MTC) surrounded by four HPGe detectors for γ rays and two plastic scintillators for β detection. Measured Eγ, Iγ, $\beta\gamma$-coin, $\gamma\gamma$-coin. Deduced level scheme of ^{82}Ge, β feedings and log *ft* values. Shell-model calculations.

1981Ho24: Mass separated fission products. Ge(Li), Si(Li). detectors. Measured Eγ, Iγ, $\gamma\gamma$.

^{82}Ge Levels

E(level)†	J^π‡	$T_{1/2}$	Comments
0.0	0^+	4.0 s *7*	$T_{1/2}$: From Adopted Levels.
1348.3 *1*	2^+	0.58 ps *8*	$T_{1/2}$: From Adopted Levels. Additional information 1.
1951.52? *20*			
2215.43 *9*	(2^+)		
2286.61 *15*	4^+		
2333.61 *15*	0^+		
2702.01 *18*			
2713.74 *20*			
2826.7? *3*			
3075.78 *19*			
3258.52 *23*			
3571.5? *5*			
3848.5? *3*			
4220.95 *23*			
5617.82 *23*	$(1^-,2^-,3^-)$		
6012.5 *5*	$(1^-,2^-,3^-)$		
6062.7 *4*	$(1^-,2^-,3^-)$		
6675.19 *23*	$(1^-,2^-,3^-)$		
6818.7 *6*	$(1^-,2^-,3^-)$		
7195+x			E(level): S(n)(^{82}Ge)=7195 *3* (2017Wa10); x<5289 *4* from Q(β^-)(^{82}Ga decay)=12484 *3* and S(n)(^{82}Ga).

† Deduced from Eγ data.

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

^{82}Ge Levels (continued)

‡ From ^{82}Ge Adopted Levels. For higher levels, adopted J^π=(1$^-$,2$^-$,3$^-$) assignments are from 2016Al10 based on possible allowed γ feeding from 2$^-$ parent, according to theoretical Gamow-Teller strengths.

β^- radiations

E(decay)	E(level)	Iβ^-†#	Log *ft*‡	Comments
(2.6×10^3& *27*)	7195+x	22 *2*		Iβ^-: from 2016Te09.
(5665.3 *31*)	6818.7	1.1 *3*	6.0 *1*	av Eβ=2564.8 *15*
(5808.8 *30*)	6675.19	0.06 *3*	7.3 *2*	av Eβ=2634.5 *15* Iβ^-: ≤0.2 (2016Al10).
(6421.3 *30*)	6062.7	1.1 *3*	6.3 *1*	av Eβ=2931.9 *15*
(6471.5 *31*)	6012.5	0.5 *1*	6.6 *1*	av Eβ=2956.2 *15* Iβ^-: ≤0.7 (2016Al10).
(6866.2 *30*)	5617.82	0.8 *2*	6.5 *1*	av Eβ=3147.9 *15* Iβ^-: ≤0.9 (2016Al10).
(8263.1 *30*)	4220.95	2.0 *4*	6.5 *1*	av Eβ=3826.2 *15* log *ft*=7.1 *5* (2016Al10).
(8635.5 *30*)	3848.5?	1.4 *3*	6.8 *1*	av Eβ=4007.0 *15*
(8912.5 *31*)	3571.5?	1.1 *3*	6.9 *1*	av Eβ=4141.4 *15*
(9225.5 *30*)	3258.52	5.5 *9*	6.3 *1*	av Eβ=4293.1 *15* Iβ^-: 5.5 *1* (2016Al10).
(9408.2 *30*)	3075.78	1.7 *4*	6.8 *1*	av Eβ=4381.7 *15*
(9657.3@ *30*)	2826.7?	0.5 *1*	7.4 *1*	av Eβ=4502.4 *15* Iβ^-: ≤0.5 (2016Al10).
(9770.3 *30*)	2713.74	4.0 *6*	6.6 *1*	av Eβ=4557.1 *15* Iβ^-: 4.0 *8* (2016Al10).
(9782.0 *30*)	2702.01	4.4 *9*	6.5 *1*	av Eβ=4562.8 *15* Iβ^-: 4.4 *6* (2016Al10).
(10150.4 *30*)	2333.61	2.8 *4*	9.2^{1u} *1*	av Eβ=4747.7 *15* Iβ^-: 2.9 *6* (2016Al10).
(10197.4 *30*)	2286.61	2.8 *2*	9.2^{1u} *1*	av Eβ=4770.6 *15* Iβ^-: 2.8 *8* (2016Al10).
(10268.6 *30*)	2215.43	17 *3*	6.0 *1*	av Eβ=4798.4 *15*
(10532.5 *30*)	1951.52?	1.1 *3*	7.3 *1*	av Eβ=4926.1 *15*
(11135.7 *30*)	1348.3	30 *5*	5.9 *1*	av Eβ=5217.8 *15* Iβ^-: 31 *7* (2016Al10).
(12484.0@ *30*)	0.0	<1.0	>10.2^{1u}	av Eβ=5885.0 *15* Iβ^-: estimated in 2016Al10 from expected average log *ft* value of 9.5 *8* for first-forbidden unique β transition.

† Deduced from transition intensity balances. Some of the Iβ values in 2016Al10 differ somewhat, as indicated in comments.
‡ Deduced based on listed Iβ values.
# Absolute intensity per 100 decays.
@ Existence of this branch is questionable.
& Estimated for a range of levels.

γ(^{82}Ge)

Iγ normalization: Summed Iγ to g.s.=78 *2* using %β^-n=22 *2* and <1.0 β feeding to the g.s.

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

$\gamma(^{82}Ge)$ (continued)

E_γ [†]	I_γ [†@]	E_i(level)	J_i^π	E_f	J_f^π
415.4 *1*	2.6 *1*	2702.01		2286.61	4^+
867.0 *1*	10.3 *14*	2215.43	(2^+)	1348.3	2^+
938.3 *1*	7.2 *1*	2286.61	4^+	1348.3	2^+
985.3 *1*	4.7 *6*	2333.61	0^+	1348.3	2^+
1348.3[#] *1*	100 *7*	1348.3	2^+	0.0	0^+
1354 *1*	6.5 *12*	2702.01		1348.3	2^+
1365.4 *2*	3.5 *6*	2713.74		1348.3	2^+
1727.4[‡] *2*	1.5 *4*	3075.78		1348.3	2^+
1910.2 *2*	10.9 *12*	3258.52		1348.3	2^+
1951.5[‡&] *2*	1.8 *4*	1951.52?		0.0	0^+
2215.43[#] *2*	18.5 *37*	2215.43	(2^+)	0.0	0^+
2714.3 *9*	3.2 *5*	2713.74		0.0	0^+
2826.6[‡&] *3*	0.8 *2*	2826.7?		0.0	0^+
2872.6[‡] *2*	3.3 *5*	4220.95		1348.3	2^+
3076.3[‡] *6*	1.3 *3*	3075.78		0.0	0^+
3360.6[‡] *3*	1.8 *4*	6062.7	$(1^-,2^-,3^-)$	2702.01	
3560.1[‡] *5*	1.8 *4*	6818.7	$(1^-,2^-,3^-)$	3258.52	
3571.4[‡&] *5*	1.8 *4*	3571.5?		0.0	0^+
3848.4[‡&] *3*	2.3 *4*	3848.5?		0.0	0^+
4269.4[‡] *2*	1.4 *3*	5617.82	$(1^-,2^-,3^-)$	1348.3	2^+
4664.1[‡] *4*	0.9 *2*	6012.5	$(1^-,2^-,3^-)$	1348.3	2^+
5326.7[‡] *2*	0.10 *4*	6675.19	$(1^-,2^-,3^-)$	1348.3	2^+

[†] γ-ray data are from 2016Al10, except where stated otherwise.
[‡] γ observed by 2016Al10.
[#] Weighted averages from 2016Al10 and 2016Te09.
[@] For absolute intensity per 100 decays, multiply by 0.60 *4*.
[&] Placement of transition in the level scheme is uncertain.

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Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays