Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 201,1 (2025)	31-Oct-2024

Q(β^-)=12978 *7*; S(n)=4220 *8*; S(p)=15266 *8*; Q(α)=−12536 *13* 2021Wa16
S(2n)=11378 *7*, S(2p)=34152 *9*, Q(β^-n)=3778 *7* (2021Wa16).
The ^{32}Al nuclide is relevant to structure of nuclides in the "island of inversion".
Mass measurements: 2015Kw01, 1991Or01, 1987Gi05, 1986Vi09.
Other measurements:
1971Ar32: first evidence of ^{32}Al formation in ^{232}Th(^{40}Ar,X) reaction at 290 MeV.
1982Mu08: ^{32}Al from ^{9}Be(^{40}Ar,X) E=11.4 GeV, measured half-life.
1984Gu19: ^{32}Al from Ir(p,X) E=10 GeV.
1995ReZZ (also 2008ReZZ): measured delayed neutrons, isotopic $T_{1/2}$.
1997IwZX: ^{64}Ni,^{181}Ta(^{48}Ca,X) E=70 MeV/nucleon at RIKEN, measured isomer half-life.
2007Ka18, 2005Ue01 (also 2007Ue02): E(^{40}Ar)=95 MeV beam produced using RIKEN accelerator. Spin polarized beam of ^{32}Al obtained by fragmentation of 95-MeV ^{40}Ar beam and using RIPS separator. Static quadrupole moment and magnetic moment of ^{32}Al g.s. determined by β-NMR method. Also 2008KaZQ, 2007Ka68, 2007TaZJ from the same group. 2008KaZQ and 2007TaZJ also report isomer $T_{1/2}$.
2006Kh08: Cross section measurement in Si(^{32}Al,X) E=30-65 MeV/nucleon, deduced 'reduced' strong absorption radius=1.23 fm *3*. The ^{32}Al beam obtained from fragmentation of ^{48}Ca beam with ^{181}Ta target at GANIL facility.
1999Ai02: Cross section measurement in Si(^{32}Al,X) E=38-80 MeV/ nucleon at NSCL facility. Deduced strong absorption radius.
2006Ro34: ^{2}H(^{40}S,X) E=99.3 MeV/nucleon, measured production σ.
2007No13: ^{9}Be(^{40}Ar,X) E=100 MeV/nucleon, measured production σ.
Structure calculations:
2020Fo04: calculated level energies, J, π.
2018Bo14: calculated 0^+ and 0^- excited states.
2017Sa48: calculated nuclear moments.
1994Po05: calculated levels, quadrupole moments, transition strenghts.

^{32}Al Levels

Cross Reference (XREF) Flags

A	^{32}Mg β^- decay (80.4 ms)	D	^{9}Be(^{36}S,Xγ),(^{40}Ar,xγ)
B	^{33}Mg β^-n decay (90.5 ms)	E	^{208}Pb(^{37}Cl,Xγ)
C	^{4}He(^{32}Al,^{32}Al′γ)		

E(level)†	J$^\pi$	$T_{1/2}$	XREF	Comments
0	1$^+$‡	32.3 ms *4*	ABCDE	%β^-=100; %β^-n=0.7 *5* (1995ReZZ) μ=+1.953 *2* (2006Hi18,2019StZV) Q=+0.0255 *3* (2018Xu05,2021StZZ) $T_{1/2}$: from weighted average of 31.7 ms *3* (2017Ha23, ion-β correlated decay); 31.7 ms *8* (1995ReZZ,2008ReZZ, ιon-b or ion-n decay); 33.0 ms *2* (2005Ue01, β decay curve for 1.4 half-lives, uncertainty increased to 0.3 ms to bring its weight down to 50%); 31 ms *6* (1988DuZT,1986Du07); and 35 ms *5* (1982Mu08). μ: value from β-NMR in 2006Hi18; sign from collinear laser spectroscopy in 2021He04. Others: 1.959 *9* from β-NMR in 2005Ue01, 2007Ue02; 1.958 *7* from β−NMR in 2018Xu05; +1.92 *4* from 2021He04. Q: value from β-NMR in 2018Xu05; sign from collinear laser spectroscopy in 2021He04. Others: 0.024 *2* from β−NMR in 2007Ka18, 2007Ue02, 2007Ka68; +0.01 *5* from 2021He04. %β^-n: from 1995ReZZ (also 2008ReZZ). r_0^2=1.29 fm^2 *9*, 1.30 fm^2 *12* (1999Ai02 in Si(^{32}Al,X) at 39.5 MeV and 69.99 MeV/nucleon). Also cross sections measured.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{32}Al Levels (continued)

E(level)[†]	J$^{\pi}$	T$_{1/2}$	XREF	Comments
				Isotope shift $\delta\nu^{27,32}$=−1401 MHz *7*(stat) *17*(syst) (2021He04).
				Mean-square charge radius $\delta<r^2>^{27,32}$=+0.12 fm^2 *9*(stat) *22*(syst) *31*(syst, mass and field shift) (2021He04).
				Mean square strong absorption radius=1.23 fm^2 *3* (2006Kh08) in Si(^{32}Al,X) reaction at E=50.18 and 57.42 MeV/nucleon, also measured energy- integrated cross sections.
				Configuration=$\pi d_{5/2}\otimes\nu d_{3/2}^{-1}$ (2005Ue01).
734.8 *4*	(2$^+$)[#]		ABCDE	
956.7 *5*	(4$^+$)[#]	186.9 ns *7*	ABCDE	%IT=100 T$_{1/2}$: from γ(t) in 2008KaZQ (with high statistics; supersedes 196 ns *16* from 2007TaZJ by the group). Other: 200 ns *20* from γ(t) in (^{36}S,Xγ) (1996Ro02); 185 ns *15* (1997IwZX).
1178.2 *6*	(4$^-$)[#]		ABC E	
1743.3? *7*			A C	XREF: A(?)
2765.2? *7*	1$^+$[‡]		A	
3202.0 *8*	1$^+$[‡]		A	

[†] From a least-squares fit to γ-ray energies, assuming $\Delta E\gamma$=1 keV where not given.
[‡] Allowed β decay (log *ft*=4.1-4.4) from 0$^+$.
[#] Shell-model predictions (2008Hi05,2004Gr08,1997Fo01), although, the ordering of the 2$^+$ and 4$^+$ is reversed in calculations in the *sd* shell space.

γ(^{32}Al)

E$_i$(level)	J$_i^{\pi}$	E$_{\gamma}$[†]	I$_{\gamma}$[†]	E$_f$	J$_f^{\pi}$	Mult.	Comments
734.8	(2$^+$)	734.8 *4*	100	0	1$^+$		E$_{\gamma}$: weighted average of 735.5 *12* from ^{32}Mg β^- decay, 735.5 *6* from (^{32}Al,^{32}Al′γ), 734.1 *3* from (^{36}S,Xγ), and 735.2 *3* from (^{37}Cl,Xγ).
956.7	(4$^+$)	221.9 *3*	100	734.8	(2$^+$)	[E2]	E$_{\gamma}$: weighted average of 221.6 *3* from (^{36}S,xγ) and 222.2 *3* from (^{37}Cl,xγ). See comment for 221.4γ from 1178 level.
1178.2	(4$^-$)	221.4 *5*	100	956.7	(4$^+$)		E$_{\gamma}$: from (^{37}Cl,xγ). 221.9γ from 957 level and 221.4γ from 1178 level are unresolved in ^{32}Mg β^- decay and (^{32}Al,^{32}Al′γ).
1743.3?		565	67 *11*	1178.2	(4$^-$)		
		787	100 *11*	956.7	(4$^+$)		
		1743[‡]	≤310	0	1$^+$		
2765.2?	1$^+$	2030	6.0 *13*	734.8	(2$^+$)		
		2765.3 *9*	100.0 *22*	0	1$^+$		
3202.0	1$^+$	2466.9 *12*	100 *10*	734.8	(2$^+$)		
		3202	49 *6*	0	1$^+$		

[†] From ^{32}Mg β^- decay, unless otherwise noted.
[‡] Placement of transition in the level scheme is uncertain.

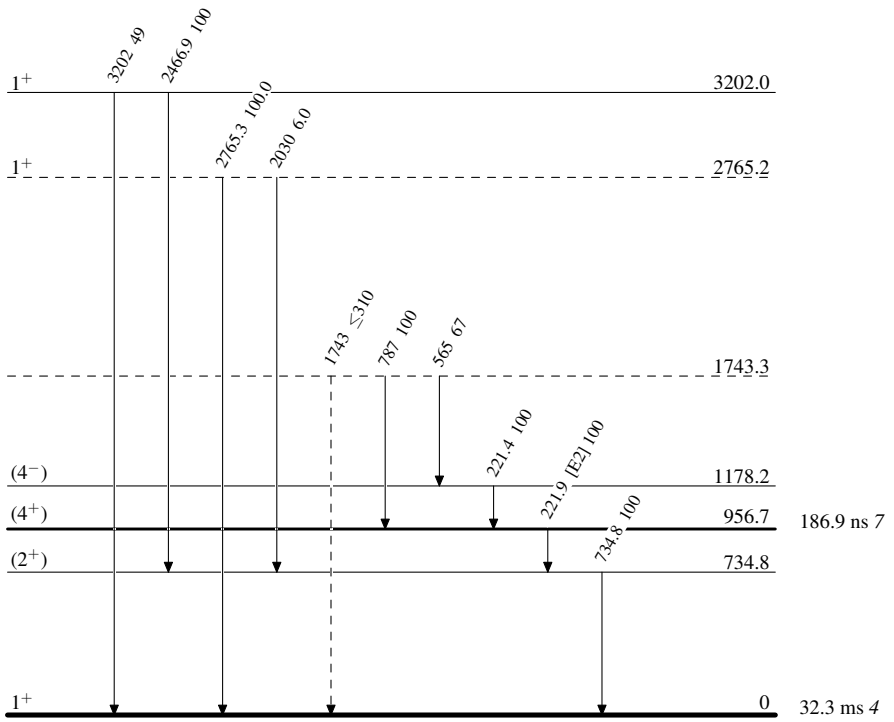
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{32}_{13}Al_{19}$