^{36}Al β^-n decay (12.0 ms) 2023Lu07

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Lijie Sun and Jun Chen	NDS 211,1 (2026)	30-Sep-2025

Parent: ^{36}Al: E=0; $T_{1/2}$=12.0 ms *20*; Q(β^-n)=1.227×10^4 *15*; %β^-n decay<31

^{36}Al-$T_{1/2}$: From implant-$\beta\gamma$ correlation (2023Lu07). Other: 14.7 ms *10* (2023Lu07, implant-β correlation), 94 ms *37* (1995ReZZ/2008ReZZ, implant-β correlation), ≈15 ms (1999YoZW, implant-β correlation, preliminary). 2023Lu07 adopted 12.0 ms *20* instead of 14.7 ms *10* based on the cleanest determination with the γ-ray gating.

^{36}Al-Q(β^-n): From 2021Wa16.

^{36}Al-%β^-n decay: From 1995ReZZ/2008ReZZ.

2023Lu07: Exp 1: ^{36}Mg and ^{36}Al were produced via the projectile fragmentation of a 140-MeV/nucleon, 80-pnA ^{48}Ca primary beam from the NSCL cyclotrons impinging on a 642-mg/cm^2-thick ^{9}Be target. The secondary cocktail beam centered around ^{33}Na was selected by the A1900 separator and implanted into a $CeBr_3$ scintillator sandwiched between two plastic scintillator veto detectors. Surrounding the implantation array were the SeGA array of 16 segmented Ge detectors and 15 $LaBr_3$ detectors. Exp 2: ^{36}Mg and ^{36}Al were produced via the projectile fragmentation of a 172.3-MeV/nucleon, 120-pnA ^{48}Ca primary beam from the FRIB linac impinging on an 8.89-mm-thick ^{9}Be target. The secondary cocktail beam centered around ^{42}Si was selected by the ARIS separator and implanted into a 5-mm-thick YSO segmented scintillator sandwiched between two plastic scintillator veto detectors. Surrounding the implantation array were 11 HPGe clover detectors and 15 fast-timing $LaBr_3$ detectors, and the VANDLE array of 88 neutron detectors. Both the NSCL and FRIB experiments in 2023Lu07 measured Eγ, Iγ, $\beta\gamma$-coin, $\gamma\gamma$-coin, implant-$\beta\gamma$ correlation and deduced $T_{1/2}$ of ^{36}Mg g.s., ^{36}Al g.s. and a ^{36}Al isomer. Comparisons with FSU shell-model calculations.

^{35}Si Levels

E(level)	J^π†	$T_{1/2}$†
0	(7/2)$^-$	0.78 s *12*
910	(3/2)$^-$	55 ps *14*

† From the Adopted Levels of ^{35}Si.

γ(^{35}Si)

E_γ	E_i(level)	J^π_i	E_f	J^π_f	Comments
910	910	(3/2)$^-$	0	(7/2)$^-$	E_γ: From 2023Lu07. 2023Lu07 observed the 910γ within the 100-ms window following the arrival of a ^{36}Al ion in both NSCL and FRIB experiments. 2023Lu07 also observed the 910γ within the 100-ms window following the arrival of a ^{36}Mg ion in both NSCL and FRIB experiments. 2013StZY observed the 910γ in ^{36}Mg decay with its maximum intensity in the 20-30 ms time window after the implantation of ^{36}Mg, indicating its origin from the granddaughter generation.

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Decay Scheme