

^{35}Si β^- decay (0.78 s) 1988DuZS,1986Du07,1988DuZT

Parent: ^{35}Si : $E=0$; $J^\pi=(7/2)^-$; $T_{1/2}=0.78$ s 12; $Q(\beta^-)=10470$ 40; $\% \beta^-$ decay=100.0

^{35}Si - J^π , $T_{1/2}$: From the Adopted Levels of ^{35}Si .

^{35}Si - $Q(\beta^-)$: From 2021Wa16.

1988DuZS,1986Du07,1988DuZT,1987DuZU: ^{35}Si was produced by the fragmentation of ^{40}Ar beam of 2×10^{11} particles/s at 60 MeV/nucleon on a 190 mg/cm² Be target at GANIL. Decay observed with a 1 mm thick plastic scintillator and a 174 cm³ intrinsic Ge detector with 1.2% absolute efficiency at 1.33 MeV. Measured $\beta\gamma(t)$, $E\gamma$, $I\gamma$. Deduced levels, J , π , parent $T_{1/2}$.

2007Ne14: measured ^{35}Si ground state magnetic moment and g -factor using the β -NMR method.

1987Wa10: shell-model calculations for ^{35}Si β^- decay scheme, ^{35}P levels, decay branching ratios, $\log ft$, and Gamow-Teller transition strengths.

The decay scheme is considered incomplete due to a large gap of about 4.9 MeV between the highest observed level at $E=5561$ and $Q(\beta^-)$ value=10470 40 (2021Wa16). There may be missing transitions from unobserved levels in the gap.

 ^{35}P Levels

$E(\text{level})^\dagger$	J^π^\ddagger	$T_{1/2}^\ddagger$
0	$1/2^+$	47.3 s 8
2386.5 5	$3/2^+$	<0.69 ps
3859.7 5	$5/2^+$	<0.69 ps
4101.2 5	$(7/2^-)$	>69 ps
4381.3? 8	$(5/2^-)$	
4493.5 6	$(7/2^-)$	2.29 ps 49
4869.4 6	$(5/2^-, 7/2^-)$	
4962.4? 7	$(9/2^-)$	
5560.7 7	$(5/2^-)$	

† From a least-squares fit to γ -ray energies.

‡ From the Adopted Levels.

 β^- radiations

$E(\text{decay})$	$E(\text{level})$	$I\beta^-^\dagger^\ddagger$	$\log ft^\dagger$	Comments
(4.91×10^3) 4	5560.7	12.7	4.6	$I\beta=12.4$ 18 and $\log ft=4.6$ from 1988DuZS.
(5.51×10^3) 4	4962.4?	5.1	5.2	Placed based on the $4959 \rightarrow 4493$ transition observed in $^{208}\text{Pb}(^{36}\text{S}, X\gamma)$ (2008Wi09) and adopted 468.9I γ from 1988DuZS to deduce its $I\beta$.
(5.60×10^3) 4	4869.4	10.8	4.9	$I\beta=10.8$ 16 and $\log ft=4.9$ from 1988DuZS.
(5.98×10^3) 4	4493.5	16.6	4.9	$I\beta=21.4$ 11 and $\log ft=4.8$ from 1988DuZS. 468.9I γ feeding this level is deducted from its $I\beta$.
(6.09×10^3) 4	4381.3?	9.7	5.1	$I\beta=9.4$ 13 and $\log ft=5.1$ from 1988DuZS.
(6.37×10^3) 4	4101.2	46.1	4.6	$I\beta=45.9$ 31 and $\log ft=4.5$ from 1988DuZS.
(8.08×10^3) 4	2386.5	1.9	8.6^{1u}	

† β -feeding from γ -ray intensity balance at each level. Quoted $I\beta^-$ values are considered upper limits due to the incomplete decay scheme, and the associated $\log ft$ values are considered lower limits.

‡ Absolute intensity per 100 decays.

 $\gamma(^{35}\text{P})$

$I\gamma$ normalization: From $\Sigma\%I(\gamma \text{ to g.s.})=100$. The deduced normalization factor of 0.27 should be considered an upper limit due to potential missing γ transitions from unobserved levels in the gap to the ground state.

Continued on next page (footnotes at end of table)

$^{35}\text{Si} \beta^-$ decay (0.78 s) **1988DuZS,1986Du07,1988DuZT** (continued) $\gamma(^{35}\text{P})$ (continued)

E_γ ‡	I_γ ‡@	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult. †	Comments
241.4 3	100 4	4101.2	(7/2 ⁻)	3859.7	5/2 ⁺	[E1]	%I γ =27
392.3 3	58.2 28	4493.5	(7/2 ⁻)	4101.2	(7/2 ⁻)	[M1+E2]	%I γ =16
468.9& 4	18.7 25	4962.4?	(9/2 ⁻)	4493.5	(7/2 ⁻)		%I γ =5.0 Unplaced γ ray in 1988DuZS . The placement is based on a 466 γ observed in $^{208}\text{Pb}(^{36}\text{S},\text{X}\gamma)$ (2008Wi09).
633.7 5	21.9 28	4493.5	(7/2 ⁻)	3859.7	5/2 ⁺	[E1]	%I γ =5.9
768.0 4	15.9 29	4869.4	(5/2 ⁻ ,7/2 ⁻)	4101.2	(7/2 ⁻)		%I γ =4.3
1009.9 5	24 5	4869.4	(5/2 ⁻ ,7/2 ⁻)	3859.7	5/2 ⁺		%I γ =6.5
1459.7 5	12 4	5560.7	(5/2 ⁻)	4101.2	(7/2 ⁻)		%I γ =3.2
1473.4 5	17 4	3859.7	5/2 ⁺	2386.5	3/2 ⁺	[M1,E2]	%I γ =4.6
1714.7 6	22 5	4101.2	(7/2 ⁻)	2386.5	3/2 ⁺	[M2]	%I γ =5.9
1994.8& 6	36 6	4381.3?	(5/2 ⁻)	2386.5	3/2 ⁺		%I γ =9.7 Placement from 1988DuZS , consistent with the 1995 γ 4381 \rightarrow 2386 transition observed in $^{208}\text{Pb}(^{36}\text{S},\text{X}\gamma)$ (2008Wi09) and the 1995 γ 4382 \rightarrow 2386 transition observed in $^9\text{Be}(^{36}\text{S},^{35}\text{P}\gamma)$ (2016Mu03). 1988DuZT and 1987Wa10 placed this γ as the 6096 \rightarrow 4101 transition. 1988Or01 placed this γ as the 6488 \rightarrow 4493 transition.
2386.4 6	117 7	2386.5	3/2 ⁺	0	1/2 ⁺	[M1,E2]	%I γ =32
3173.5 10	35 6	5560.7	(5/2 ⁻)	2386.5	3/2 ⁺		%I γ =9.5 1988Or01 suggested that this γ ray cannot be placed into the decay scheme of ^{35}Si , and it could be a transition to the 4101 or 4493 levels based on intensity balances.
^x 3349.1# 10	46# 6						%I γ =12
^x 3590.0# 11	60# 7						%I γ =16
3859.5 10	121 8	3859.7	5/2 ⁺	0	1/2 ⁺	[E2]	%I γ =33
4100.8 10	135 8	4101.2	(7/2 ⁻)	0	1/2 ⁺	[E3]	%I γ =36

† From the Adopted Levels.

‡ From **1988DuZS**, unless otherwise noted.# From **1986Du07**. **1988Or01** tentatively suggested that these γ rays de-excite a level at 7450, but this suggestion has not been experimentally confirmed.

@ For absolute intensity per 100 decays, multiply by 0.27.

& Placement of transition in the level scheme is uncertain.

^x γ ray not placed in level scheme.

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Decay Scheme

Intensities: I_γ per 100 parent decays

Legend

- \longrightarrow $I_\gamma < 2\% \times I_\gamma^{\max}$
 \longrightarrow $I_\gamma < 10\% \times I_\gamma^{\max}$
 \longrightarrow $I_\gamma > 10\% \times I_\gamma^{\max}$
 \cdots γ Decay (Uncertain)

