^{9}Be(^{36}Si,^{35}Alγ) 2014St18

^{36}Si->p+^{35}Al from $J^{\pi}=0^{+}$ ^{36}Si ground state.

One-proton knockout reaction from $J^{\pi}=0^{+}$ ^{36}Si ground state.

2014St18: A ^{36}Si secondary beam was produced via the projectile fragmentation of a 140-MeV/nucleon ^{48}Ca primary beam impinging on a ^{9}Be target at NSCL, MSU and was selected by the A1900 separator. The states of ^{35}Al and ^{35}Si were populated by the one-proton/neutron knockout reactions, respectively, from the ^{36}Si beam at a midtarget energy of 97.7(5) MeV/nucleon on a 287-mg/cm^{2} ^{9}Be secondary target. Knockout residues were identified from their energy loss measured by an ionization chamber at the focal plane of the S800 spectrometer and from their ToF measured between two scintillators at the object position and at the focal plane of the S800 spectrometer. The position and angle of the residues were measured using two cathode-readout drift chambers. Prompt γ rays from the deexcitation of the residues were detected by the GRETINA Ge array. Measured Doppler-corrected Eγ, Iγ, (^{35}Al)γ-coin, $\gamma\gamma$-coin, the parallel momentum distributions of populated states in ^{35}Al residues. Deduced levels, J, π, L-transfers, inclusive and exclusive knockout cross section for producing ^{35}Al from ^{36}Si. Calculations using eikonal model and shell model calculations with SDPF-U and SDPF-MU interactions.

^{35}Al Levels

Total knockout σ=22 mb *1* for producing ^{35}Al from ^{36}Si.

E(level)†	J^{π}‡	L‡	Comments
0	(5/2)$^{+}$	2	J^{π}: interpreted as the $1d_{5/2}$ proton removal from ^{36}Si. Partial knockout σ=13 mb *2*.
801 *3*			Partial knockout σ=1.0 mb *7*.
1005 *3*			Partial knockout σ=0.8 mb *9*.
1865 *4*			Partial knockout σ=1.0 mb *2*.
1973 *4*	3/2^{+},5/2^{+}	2	Partial knockout σ=3.2 mb *5*.
2733 *7*			Partial knockout σ=0.5 mb *1*.
3244 *5*	3/2^{+},5/2^{+}	2	Partial knockout σ=2.6 mb *3*.
4275? *9*	3/2^{+},5/2^{+}	2	Partial knockout σ=0.5 mb *1*.

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

‡ 2014St18 deduced L by comparing the measured and eikonal-calculated parallel momentum distributions of residuals. J^{π} options are deduced accordingly.

γ(^{35}Al)

E_{γ}	I_{γ}	E_i(level)	J^{π}_i	E_f	J^{π}_f
802 *4*	10 *1*	801		0	(5/2)$^{+}$
859 *4*	3.6 *3*	1865		1005	
968 *4*	4.4 *3*	1973	3/2^{+},5/2^{+}	1005	
1003 *4*	19 *1*	1005		0	(5/2)$^{+}$
1064 *4*	0.8 *2*	1865		801	
1174 *5*	2.8 *3*	1973	3/2^{+},5/2^{+}	801	
^{x}1473 *5*	1.1 *2*				
1932 *6*	2.5 *3*	2733		801	
1972 *6*	7.5 *5*	1973	3/2^{+},5/2^{+}	0	(5/2)$^{+}$
2237 *6*	7.8 *6*	3244	3/2^{+},5/2^{+}	1005	
2440 *7*	1.4 *2*	3244	3/2^{+},5/2^{+}	801	
^{x}3060 *8*	1.6 *4*				
3250 *8*	3.3 *4*	3244	3/2^{+},5/2^{+}	0	(5/2)$^{+}$
4275 *9*	3 *1*	4275?	3/2^{+},5/2^{+}	0	(5/2)$^{+}$

^{x} γ ray not placed in level scheme.

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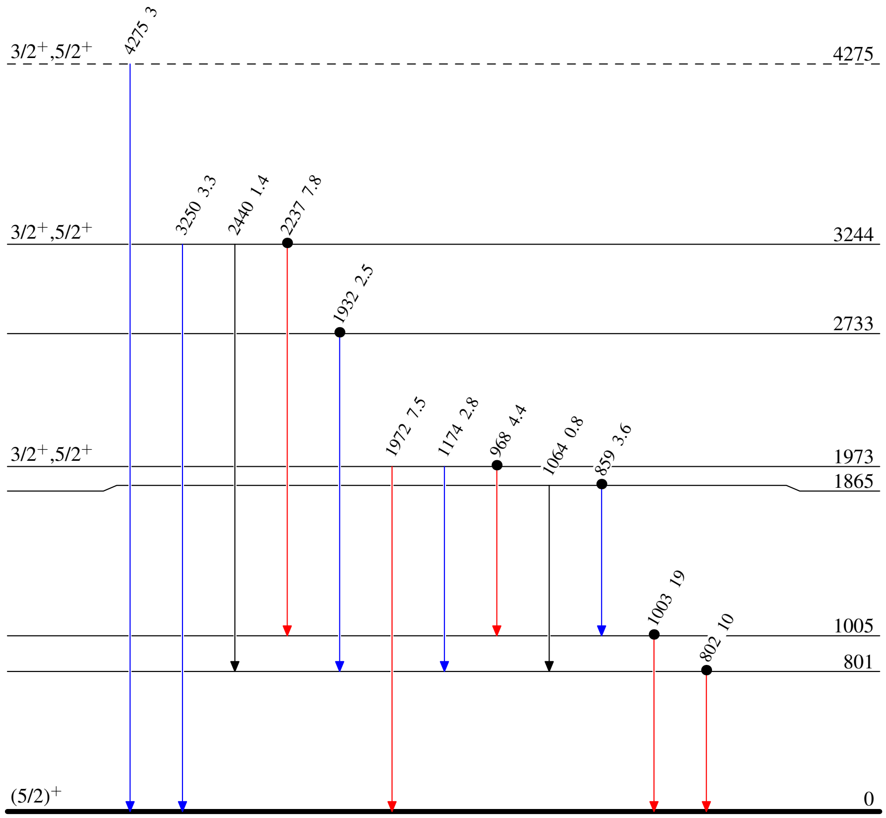
Level Scheme

Intensities: Yield/100 ions

Legend

$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$
Coincidence



$^{35}_{13}Al_{22}$