

$^9\text{Be}(^{36}\text{Ca}, ^{35}\text{Ca})$ 2012Sh21

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

$J^\pi=0^+$ for ^{36}Ca ground state.

2012Sh21: A ^{36}Ca secondary beam was produced via the projectile fragmentation of a 140-MeV/nucleon ^{40}Ca primary beam impinging on a ^9Be target at NSCL, MSU. The ^{36}Ca nuclei were selected by the A1900 separator to a purity of 8%. The ground states of ^{35}K and ^{35}Ca were populated by the one-proton/neutron knockout reactions, respectively, from the ^{36}Ca beam at a midtarget energy of ≈ 70 MeV/nucleon on a 188-mg/cm² ^9Be 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 CsI(Na) γ -ray spectrometer CAESAR was placed around the Be target position of the S800 to search for γ decay of any excited states of the residuals formed in knockout reactions. Measured knockout cross sections for producing ^{35}K and ^{35}Ca from ^{36}Ca and the longitudinal momentum distribution of residuals. Deduced J , π , orbital angular momenta of the nucleons removed from ^{36}Ca , and spectroscopic factors. Calculated single-particle cross sections (σ_{sp}) for neutron removal and longitudinal momentum distributions using eikonal models.

 ^{35}Ca Levels

E(level)	J^π	L	$C^2S^\dagger$	Comments
0.0	$1/2^+$	0	0.45 8	J^π: from L(n)=0 from 0^+, interpreted as knockout from neutron $2s_{1/2}$ orbital. L: 2012Sh21 deduced L by comparing the measured and eikonal-calculated longitudinal momentum distributions of residuals. C^2S: from eikonal/Hartree-Fock model with $R_s=0.24$ 2, uncertainty only include experimental contributions. Others: 0.49 8 from eikonal/Strong Absorption model with $R_s=0.26$ 2 and also from transfer-to-continuum model; $R_s=0.26$ 2; 1.80 from shell model. $\sigma_{\text{exp}}=5.03$ mb 46. Calculated values: $\sigma_{\text{sp}}=11.1$ mb from eikonal/Hartree-Fock model; $\sigma_{\text{sp}}=10.2$ mb from eikonal/Strong Absorption model; $\sigma_{\text{sp}}=10.3$ mb from transfer-to-continuum model.

[†] Spectroscopic factor $C^2S=\sigma_{\text{exp}}/\sigma_{\text{sp}}$.