

$C(^{36}\text{Mg}, ^{35}\text{Mg}\gamma), (^{37}\text{Al}, ^{35}\text{Mg}\gamma)$ **2017Mo26**

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

2017Mo26: A secondary beam composed of ^{36}Mg and ^{37}Al was produced via the projectile fragmentation of a 345-MeV/nucleon ^{48}Ca primary beam impinging on a ^9Be target and selected by the BigRIPS separator at RIKEN. $E(^{36}\text{Mg})=235$ MeV/nucleon and $E(^{37}\text{Al})=246$ MeV/nucleon in front of the 2.54 g/cm² carbon secondary target. The reactions leading to ^{35}Mg from ^{36}Mg and ^{37}Al are likely 1n-knockout and 1p1n-removal reactions, respectively. The reaction residues were selected and identified by the Zero Degree spectrometer using the B ρ - ΔE -ToF method. The γ rays in coincidence with ^{35}Mg residues were detected using the DALI2 array of 186 NaI(Tl) crystals at 20°–150°. Measured $E_\gamma(>200\text{ keV})$, I_γ , $(^{35}\text{Mg})\gamma$ -coin, the inclusive one-neutron knockout cross section and exclusive γ -ray emission cross sections, and parallel momentum distributions of ^{35}Mg in coincidence with γ rays. Deduced levels, L-transfers, J, and π . Compared with shell-model calculations using the SDPF-M interaction in the sd shell with $\nu 1f_{7/2}$ and $\nu 2p_{3/2}$ orbits, and the SDPF-M interaction in a model space up to $\nu 2p_{1/2}$, and antisymmetrized molecular dynamics (AMD) model calculations using the Gogny D1S force.

 ^{35}Mg Levels

<u>$E(\text{level})^\dagger$</u>	<u>J^π^\ddagger</u>	<u>L</u>	<u>Comments</u>
0			J^π : $3/2^-$ from shell-model calculations with the SDPF-M and SDPF-M+ $2p_{1/2}$ interactions; $3/2^+$ from AMD with the Gogny D1S force (2017Mo26).
0+x			$E(\text{level})$: <200 keV; the detection threshold in 2017Mo26 . $1/2^-$ at 141 keV from shell-model calculations with the SDPF-M+ $2p_{1/2}$ interaction.
0+y?	($5/2^-$, $7/2^-$)		$E(\text{level})$: <200 keV; the detection threshold. 2017Mo26 suggested a low-lying L=3 level from the observed 42(1)% L=3 component in the inclusive parallel momentum distribution.
206+x 8			J^π : γ -ray intensity is too low to be assigned to the $1/2^-$ level at 141 keV from shell-model calculations with the SDPF-M+ $2p_{1/2}$ interaction (2017Mo26).
443+x 7	($3/2^+$, $5/2^+$)	(2)	
616+x 8	($1/2^-$, $3/2^-$)	(1)	
670+x 8			

† From E_γ data. **2017Mo26** suggested that all the four observed γ rays were emitted independently and fed either the ground state or a low-lying excited state below 200 keV.

‡ From measured parallel-momentum distributions and deduced L-transfers.

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

2017Mo26 stated that no clear $\gamma\gamma$ coincidence was observed.

<u>E_γ</u>	<u>I_γ^\dagger</u>	<u>$E_i(\text{level})$</u>	<u>J^π_i</u>	<u>E_f</u>	<u>Comments</u>
206 8	2 I	206+x		0+x	
443 7	8 I	443+x	($3/2^+$, $5/2^+$)	0+x	2017Mo26 assigned this γ to the $3/2^+$ at 788 keV \rightarrow $3/2^-$ g.s. transition based on shell-model calculations with the SDPF-M+ $2p_{1/2}$ interaction (2017Mo26).
616 8	7 I	616+x	($1/2^-$, $3/2^-$)	0+x	2017Mo26 assigned this γ to the $3/2^-$ at 664 keV \rightarrow $1/2^-$ at 141 keV transition based on shell-model calculations with the SDPF-M+ $2p_{1/2}$ interaction (2017Mo26).
670 8	3 I	670+x		0+x	E_γ : From 2011Ga15 , as this γ is not resolved from the 616 γ in 2017Mo26 , but its presence is indicated in the fit of the spectrum. 2017Mo26 stated that the origin of the 670 γ remained vague.

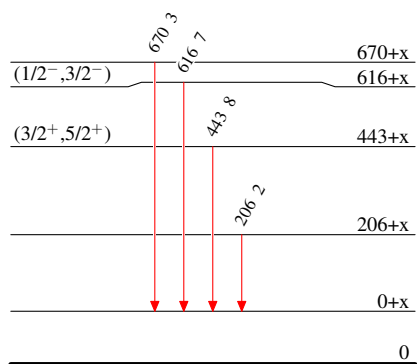
† γ -ray emission σ (mb).

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Level Scheme

 Intensities: γ -ray emission σ (mb)

Legend

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


 $^{35}_{12}\text{Mg}_{23}$