C(^{36}Mg,^{35}Mgγ),(^{37}Al,^{35}Mgγ) 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 ^{9}Be target and selected by the BigRIPS separator at RIKEN. E(^{36}Mg)=235 MeV/nucleon and E(^{37}Al)=246 MeV/nucleon in front of the 2.54 g/cm^2 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 Bρ-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 Eγ(>200 keV), Iγ, (^{35}Mg)γ-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

E(level)†	J$^\pi$‡	L	Comments
0			J$^\pi$: 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(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(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$^\pi$: 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 Eγ 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.

γ(^{35}Mg)

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

E$_\gamma$	I$_\gamma$†	E$_i$(level)	J$_i^\pi$	E$_f$	Comments
206 *8*	2 *1*	206+x		0+x	
443 *7*	8 *1*	443+x	(3/2$^+$,5/2$^+$)	0+x	2017Mo26 assigned this γ to the 3/2$^+$ at 788 keV -> 3/2$^-$ g.s. transition based on shell−model calculations with the SDPF−M+2p$_{1/2}$ interaction (2017Mo26).
616 *8*	7 *1*	616+x	(1/2$^-$,3/2$^-$)	0+x	2017Mo26 assigned this γ to the 3/2$^-$ at 664 keV -> 1/2$^-$ at 141 keV transition based on shell−model calculations with the SDPF−M+2p$_{1/2}$ interaction (2017Mo26).
670 *8*	3 *1*	670+x		0+x	E$_\gamma$: From 2011Ga15, as this γ is not resolved from the 616γ in 2017Mo26, but its presence is indicated in the fit of the spectrum. 2017Mo26 stated that the origin of the 670γ remained vague.

† γ-ray emission σ (mb).

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Level Scheme

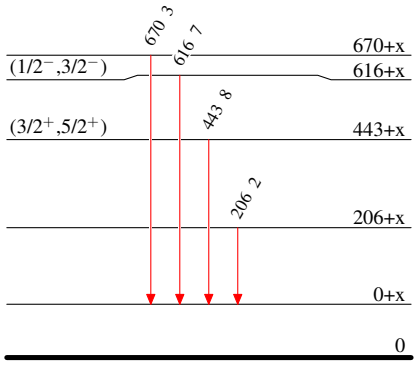
Intensities: γ-ray emission σ (mb)

Legend

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

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

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



$^{35}_{12}Mg_{23}$