^{9}Be(^{32}Al,^{31}Mgγ) 2009Mi12

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen and Balraj Singh	NDS 184, 29 (2022)	24-Jun-2022

Includes ^{9}Be(^{34}Si,^{31}Mgγ) from 2019El09, which report the spectrum of 240γ from the 460 level used to demonstrate a new technique to study isomeric decay.

2009Mi12: E=91 MeV/nucleon ^{32}Al beam was produced in fragmentation of 140 MeV/nucleon ^{48}Ca primary beam on a 806 mg/cm^2 ^{9}Be target at NSCL. Fragments were separated using the A1900 mass separator and identified using time-of-flight from A1900 to the S800 spectrograph. The secondary target was 185 mg/cm^2 ^{9}Be. γ rays were detected with the SeGA array of 32-fold segmented HPGe detectors. Measured Eγ, Iγ, $\gamma\gamma$-coin, $\gamma(\theta)$, (particle)γ coin, cross sections. Deduced levels, J, π. Comparison with theoretical calculations using antisymmetrized molecular dynamics (AMD) and generator coordinate method (GCM), and with USD shell-model.

Additional information 1.

^{31}Mg Levels

E(level)†	J$^\pi$‡	T$_{1/2}$	σ (mb)	Comments
0.0	1/2$^+$		0.33 *14*	
49.8 *9*	3/2$^{(+)}$			
220.7 *9*	3/2$^{(-)}$			
460 *3*	(7/2$^-$)	10.5 ns *8*		T$_{1/2}$: from Adopted Levels.
673.2 *7*	3/2$^+$		3.56 *20*	J$^\pi$: from $\gamma(\theta)$ as shown in figure 8 of 2009Mi12.
943.7 *14*	(5/2$^+$)			
1152 *3*	(7/2$^+$)		0.53 *13*	
2015.2 *16*	5/2$^+$		4.27 *24*	

† From a least-squares fit to γ-ray energies measured in 2009Mi12.

‡ As assigned by 2009Mi12 based on cross sections, $\gamma(\theta)$ and model considerations.

γ(^{31}Mg)

E$_\gamma$†	I$_\gamma$†	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Comments
171.1‡	77 *4*	220.7	3/2$^{(-)}$	49.8	3/2$^{(+)}$	
220.9‡	24.2 *15*	220.7	3/2$^{(-)}$	0.0	1/2$^+$	
(239.9)		460	(7/2$^-$)	220.7	3/2$^{(-)}$	Eγ: from the Adopted Gammas. This transition is not observed in this work due to the isomeric half-life of the deexcited level and ^{31}Mg residues quickly traveling through the detector setup for detecting prompt γ rays at a velocity near 0.4c.
452.6 *6*	13.2 *18*	673.2	3/2$^+$	220.7	3/2$^{(-)}$	
623.3 *5*	64 *4*	673.2	3/2$^+$	49.8	3/2$^{(+)}$	
673.2 *7*	34.2 *23*	673.2	3/2$^+$	0.0	1/2$^+$	
692.6 *8*	16.8 *14*	1152	(7/2$^+$)	460	(7/2$^-$)	
894.4 *13*	9.0 *17*	943.7	(5/2$^+$)	49.8	3/2$^{(+)}$	
1072.7# *19*	10.1 *16*	2015.2	5/2$^+$	943.7	(5/2$^+$)	
x1104.0 *16*	13.0 *19*					
x1500.1 *24*	13 *3*					
1555.7# *22*	24 *3*	2015.2	5/2$^+$	460	(7/2$^-$)	
x1707 *3*	15 *8*					
1793.4 *18*	100	2015.2	5/2$^+$	220.7	3/2$^{(-)}$	
x1936 *4*	9 *4*					
x1968 *4*	17 *5*					

Continued on next page (footnotes at end of table)

^{9}Be(^{32}Al,^{31}Mgγ) 2009Mi12 (continued)

$\gamma(^{31}Mg)$ (continued)

† From 2009Mi12, unless otherwise noted.
‡ 2009Mi12 take Eγ from literature; quoted values are from Adopted Gammas. Measured values are subject to effects due to the lifetime of the state (2009Mi12).
# Placement of transition in the level scheme is uncertain.
x γ ray not placed in level scheme.

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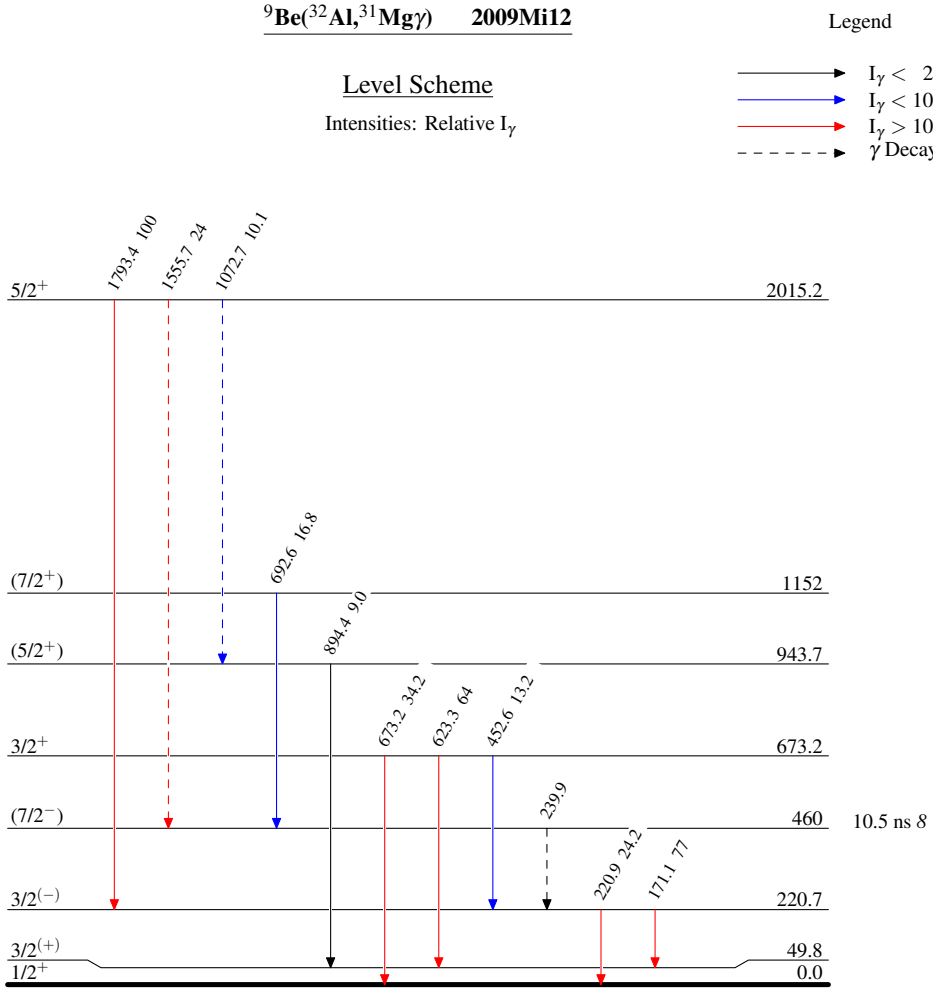
Level Scheme

Intensities: Relative I_γ



$^{31}_{12}Mg_{19}$