^{24}Mg(α,α') 2021Ad09,2018Ad01

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. Shamsuzzoha Basunia, Anagha Chakraborty	NDS 186, 2 (2022)	31-Mar-2022

Others: 2016Gu05, 2015Gu17, (2013Ka24, 2012Ka32, 2011KaZU are conference articles from the same research group of 2018Ad01, 2015Gu17, 2016Gu05), (2009Yo09, 1999Yo05 − from same authors), 1985Zw02, 1968Na02, 1966Ko05.

2021Ad09: E(α)=200 MeV at iThemba LABS (Cape Town, South Africa). Reaction products were momentum analyzed using the K600 magnetic spectrometer, detectors consisted of two wire chambers and two plastic scintillating paddles. The spectrometer was operated in two modes: 1) zero-degree mode which measured scattering angles of 2° or less and 2) small angle mode which measured scattering angles from 2° to 6°. Measured Eα, $\sigma(\theta)$; identified 0^+ states and 1^- states.

2018Ad01: Beams of 130 and 386 MeV α particles, from the RCNP/OSAKA cyclotron, impinged on a >99.9% enriched 1.2 or 2.5 mg/cm^2 ^{24}Mg target foil that was located at the Grand Raiden target position. The scattered α were momentum analyzed in the spectrometer and detected at the focal plane between θ=5.39° to 70.4° (E_α=130 MeV); θ=5.26° to 28.8° (E_α=386 MeV) from (Kawabata et al., J. Phys. Conf. Ser. 321, 012012 (2011) − same article 2013Ka24, 2011KaZU). DWBA calculations using both density-dependent and density-independent αN interactions.

2016Gu05: Eα=386 MeV beam from the RCNP/OSAKA cyclotrons, impinged on a >99% enriched 0.7 mg/cm^2 ^{24}Mg target foil that was located at the Grand Raiden target position. The scattered α were momentum analyzed in the spectrometer and detected at the focal plane between θ=3.5° to 26.5°. For giant-resonances, measurements were performed at forward angles (from 0° to 10.4°). Deduced strength distributions for isoscalar giant resonances with multipolarity ≤2. DWBA calculations, multipole decomposition analysis (MDA) plotted with angular distribution data of binned energy spectrum (listed bin width).

2009Yo09: Eα=240 MeV beam from the Texas A&M cyclotron, bombarded a self-supporting enriched to 99.96% in ^{24}Mg (0.7 mg/cm^2) located at the multipole-dipole-multipole spectrometer. The scattered αs were measured both in- and out-of-plane angles. Data were taken at spectrometer angles of θ=0°, 4.0°, and 6.0°. Isoscalar E0, E1, E2, and E3 strength was identified from 9 MeV< Ex < 40 MeV. DWBA calculations are plotted with of measured angular distribution data of binned energy spectrum (600 keV). Also in 1999Yo05 (from the same research group) B(EL) or %EWSR values are reported − listed in the comments.

1968Na02: E=42−MeV at the University of Washington cyclotron, 60-in scattering chamber; single Si-diffused junction detector; measured elastic and inelastic α particles in the range θ(lab) = 10° to 60°; extracted deformation distances (not listed in the dataset). FWHM = 140 to 300 keV.

1966Ko05: E=28.4 MeV; measured inelastic α particles; extracted the level; extracted the collective enhancement of the 3^- and 2^+ states at 8.4- and 1.37-MeV, respectively. Data listed in the comments.

^{24}Mg Levels

$\beta^2_{R,0}$ are dimentionless scaling factor for the data compared to that of the DWBA calculations (2021Ad09) are listed in comments.

In 1999Yo05 B(EL) values are listed in units of $e^l fm^{2l}$. From comparing of lifetime of the 2^+ state at 7349 and the value obtained using the data in Table III (1999Yo05) adopted γ-ray properties, it appears that the unit is a misprint in 1999Yo05 for e^2b^l. Authors of 2015Gu17 also noted this point. Evaluators list the data using the later unit with their corresponding 'l' value.

In 2016Gu05, The isoscalar E0, E1, and E2 strengths are observed to be 57 *7*%, 111.1 *+109−72*%, and 148.6 *73*%, respectively, of their energy-weighted sum rules in the excitation energy range of 6 to 35 MeV.

E(level)[†]	J$^\pi$[b]	L[d]	S_0[e]	Comments
4.12×10^3[#]	4^+	4		B(E4)=0.00018 *+3−8* e^2b^4 (1999Yo05).
4.24×10^3[#]	2^+	2		B(E2)=0.044 *+10−3* e^2b^2 (1999Yo05). B(E2)=0.00336 *9* e^2b^2 (2015Gu17).
6.01×10^3[#]	4^+	4		B(E4)=0.00023 *+7−10* e^2b^4 (1999Yo05). B(E4)=0.000292 *6* e^2b^4 (2015Gu17).
6.43×10^3[#@&]	0^+	0		EWSR=5.6% *10* (1999Yo05) and 4.85% *12* (2015Gu17).
7.35×10^3[#@]	2^+	2		B(E2)=0.0015 *+8−2* e^2b^2 (1999Yo05). B(E2)=0.00145 *+1−6* e^2b^2 (2015Gu17).
7555.3[‡] *10*	1^-[c]		2.6 *5*	EWSR=3% *1* (1999Yo05) and 3.1% *6* (2015Gu17). $\beta^2_{R,0}$=0.000078 *16* (2021Ad09).

Continued on next page (footnotes at end of table)

^{24}Mg(α,α') 2021Ad09,2018Ad01 (continued)

^{24}Mg Levels (continued)

E(level)[†]	J$^{\pi}$[b]	L[d]	S$_0$[e]	Comments
7.62×10^3[#@]	3$^-$	3		B(E3)=0.0011 +*2*−*3* e^{2}b^3 (1999Yo05). B(E3)=0.00106 *3* e^{2}b^3 (2015Gu17).
8.36×10^3[#@]	3$^-$	3		B(E3)=0.0025 *4* e^{2}b^3 (1999Yo05). B(E3)=0.00146 +*6*−*15* e^{2}b^3 (2015Gu17). The collective enhancement of the 3$^-$ level is determined as B(E3)/B(E3)$_{s.p.}$=2.9 (1966Ko05).
8438.4[‡] *10*	1$^-$[c]		10 *2*	$\beta^2_{R,0}$=0.00027 *5*.
9.00×10^3[#@]	2$^+$	2		
9146.2[‡] *3*	1$^-$[c]		2.4 *5*	$\beta^2_{R,0}$=0.000058 *12*.
9305.39[‡] *24*	0$^+$[c]		1.4 *3*	$\beta^2_{R,0}$=0.0009 *2*.
10.36×10^3[#]	2$^+$	2		
10679.7[‡] *3*	0$^+$[c]		0.29 *6*	$\beta^2_{R,0}$=0.00018 *4*.
11390 *20*	0$^+$[c]		0.12 *2*	E(level): Appears to be from 2021Ad09, although not noted. S$_0$: from 0° data alone. $\beta^2_{R,0}$=0.00006 *3*.
11730[‡] *2*	0$^+$[c]		1.0 *2*	$\beta^2_{R,0}$=0.0005 *1*.
11862.8[‡] *13*	1$^-$[c]		11 *2*	$\beta^2_{R,0}$=0.00021 *4*.
13130 *20*	0$^+$[c]		1.1 *2*	E(level): Appears to be from 2021Ad09, although not noted. $\beta^2_{R,0}$=0.00025 *5*.
13190[a] *20*	1$^-$[c]		2.9 *6*	$\beta^2_{R,0}$=0.000049 *10*.
13370[a] *10*	0$^+$[c]		0.5 *1*	$\beta^2_{R,0}$=0.00025 *5*.
13790[a] *10*	0$^+$[c]		1.7 *3*	$\beta^2_{R,0}$=0.0011 *2*.
13890[a] *10*	0$^+$[c]		2.6 *5*	$\beta^2_{R,0}$=0.0009 *2*.
15330[a] *30*	0$^+$[c]		1.9 *4*	$\beta^2_{R,0}$=0.0006 *1*.
15790[a] *30*	0$^+$[c]		1.1 *2*	$\beta^2_{R,0}$=0.00037 *7*.

[†] From 2018Ad01, except where otherwise noted.
[‡] Reported in 2021Ad09, excitation energy from Adopted Levels.
[#] Populated by E$_{\alpha}$=130 MeV.
[@] Populated by E$_{\alpha}$=386 MeV (2011KaZU).
[&] Level also reported in 2021Ad09 and excitation energy reported from previous 2007Fi14 (previous evalution).
[a] From 2021Ad09.
[b] From L value in 2018Ad01, except where otherwise noted.
[c] From 2021Ad09, based on comparison of differential cross sections to DWBA calculations.
[d] From DWBA calculations and measured differential cross sections (mb/sr) (2018Ad01).
[e] Percentage of the EWSR (energy-weighted sum rules) exhausted by the state.