

$^{90}\text{Zr}(\alpha,\alpha')$ 1986La18

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	S. K. Basu, E. A. McCutchan		NDS 165,1 (2020)	1-Mar-2020

1986La18: $E\alpha=35.4$ MeV. Magnetic spectrograph, FWHM=35-50 keV. Measured $\sigma(\theta)$, $\theta=10^\circ-50^\circ$.

1987Ry01: $E\alpha=35.4$ MeV. Magnetic spectrograph, FWHM=40-70 keV. Measured $\sigma(\theta)$, $\theta=10^\circ-50^\circ$.

1968Ma30: $E\alpha=31$ MeV. Si detectors, FWHM=80 keV. Measured $\sigma(\theta)$, $\theta=16^\circ-70^\circ$.

1995Lu05: $E\alpha=34.5$ MeV. Magnetic spectrometer. Measured $\sigma(\theta)$, $\theta=8^\circ-46.5^\circ$. Determined B(E2) \uparrow and B(E3) \uparrow .

2018Gu05: $E(\alpha)=385$ MeV beam was from the ring cyclotron facility of the Research Center for Nuclear Physics (RCNP). Target was self-supporting foil of 97.7% enriched ^{90}Zr with a thickness within 4.0 to 5.4 mg/cm². Inelastically scattered particles were momentum-analyzed with the high-resolution magnetic spectrometer Grand Raiden and detected with a focal-plane detector system consisting of two position-sensitive multi-wire drift chambers (MWDCs) and two plastic scintillators. Measured $\sigma(E_\alpha,\theta)$. Deduced energies, widths, percentages of energy weighted sum rule (EWSR) of the isoscalar giant monopole (ISGMR), dipole (ISGDR) and quadrupole (ISGQR) from DWBA analysis.

Others: 1966Bi05, 1973Bi12, 1974Ce03, 1975Gi10, 1978ToZU, 1989Ku29, 1990Bu25, 2001Cl01, 2004Yo05, 2004Lu04, 2013Yo07, 2015Kr08, 2016Gu13.

Data are from 1986La18, except as noted. There is good agreement between the results of 1968Ma30 and 1986La18.

For studies of projectile excitation in (α,α') , see 1979Ka03.

For discussion of isospin decomposition of matrix elements, see 1987Ry01, 1990Bu25.

 ^{90}Zr Levels

Parameters of strength distributions of the giant resonances are deduced from DWBA analysis of measured differential cross sections (2018Gu05).

E(level) \uparrow	L \ddagger	$\beta R\ddagger$	Comments
0			
2194	2	0.42	B(E2) $\uparrow=0.063$ 5 (1995Lu01).
2327	5	0.34	
2754	3	0.77	B(E3) $\uparrow=0.051$ to 0.091 (1995Lu01).
3082	4	0.21	
3319	2	0.19	
3463	6	0.12	
3839	2	0.25	
3957	5	0.25	
4056	4	0.14	
4121	0		
4229	2	0.14	
4305	4	0.08	
4334	4	0.25	
4374	7	0.19	
4491	3	0.13	
4542	6	0.14	
4685	2	0.14	
4821			
4941	4	0.07	
5060	(7)		
5114	3	0.20	
5215	4	0.15	
5317			
5382	4	0.20	
5464	4	0.18	
5512	1		
5582	(3)		
5630	3	0.27	

Continued on next page (footnotes at end of table)

$^{90}\text{Zr}(\alpha, \alpha')$ **1986La18 (continued)** ^{90}Zr Levels (continued)

<u>E(level)[†]</u>	<u>J^π</u>	<u>Γ</u>	<u>L[‡]</u>	<u>βR[‡]</u>	<u>Comments</u>
5671			3	0.22	
5778			3	0.18	
5891			1		
5951			3	0.19	
13.99×10 ³ 7	2 ⁺	7.44 MeV +30–28	2		%EWSR=108 5 (ISGQR). E(level), J ^π , Γ: from 2018Gu05 .
16.76×10 ³ 12	0 ⁺	4.96 MeV +31–32	0		%EWSR=75 9 (ISGMR). E(level), J ^π , Γ: from 2018Gu05 . E(level): other: 16550 50 (2016Gu13). Γ: other: 4.2 MeV 3 (2016Gu13).
27.8×10 ³ 9	1 ⁻	11.3 MeV +24–27	1		E(level): from 27.8×10 ³ +10–8 in 2018Gu05 . %EWSR=69 12 (ISGDR). E(level), J ^π , Γ: from 2018Gu05 .

[†] From [1986La18](#) with general statement that uncertainty is 10-15 keV, except where noted.

[‡] From comparison with DWBA calculations ([1986La18](#)), except where noted.