^{100}Mo(p,p′) 1992Pi08,1987Fr07

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 172,1 (2021)	31-Jan-2021

Includes (p,p′γ) and (p,p′ce) (1977Re04,1973InZY,1972AnZP).

1992Pi08, 1990Pi14: E=30.7 and 51 MeV beams from the KVI cyclotron. Measured $\sigma(\theta)$ from 8° to 88° in steps of 4°, with the QMG/2 spectrograph (FWHM=10-15 keV). Deduced levels, J, π, transition strengths from the analysis using coupled channels calculations. Uncertainty in cross sections is 10% (absolute) and 4-6% (relative). Coupled-channel calculations and IBA model predictions. 1992Pi08 provide data for hexadecapole (E4) transitions and 1990Pi14 for negative-parity octupole transitions.

1987Fr07: E=25.6 MeV. Enriched target. Resolution=20 keV. $\sigma(\theta)$ data from 7.5° to 168° (c.m.) in steps of 2.5° to 5°. See also 1987Fr19, 1986Kn02 and 1984Kn02 from the same laboratory.

Others dealing with optical-model parameters deduced from $\sigma(\theta)$ data for g.s. and first 2^+ state using coupled-channel and DWBA calculations:

Additional information 1.

1992Ke07: reanalysis of (p,p′) data of 1987Fr07 (E=25.6 MeV) and those of 1971Lu07 (E=15.0 MeV) for first 2^+ and 3^- levels.

1992Ri06: E=100, 120, 150, 175, 200 MeV. Measured $\sigma(\theta)$. Calculations for multi-step mechanism.

1987Fr19, 1986Kn02, 1984Kn02: from the same group as 1987Fr07.

1995Zh44: (p,p) E(p)=6.7-6.9 MeV. Measured $\sigma(\theta)$.

1987Wa27: E(p)=18 MeV.

1986BlZS: E(p)=30.7 MeV.

1985Fl01: (p,p) E(p)=2-6.5 MeV.

1984Pi01 (same group as 1992Pi08): E(p)=51 MeV (11 levels given with deduced deformation parameters and transition matrix elements).

1983Ce02, 1982Ce04: E(p)=22.3 MeV (3 levels given).

1982Sa19: (pol p,p) E(p)=65 MeV.

1977Re04: (p,p′γ) E(p)=6.975 MeV. ce data for 695 level.

1975Bu04: E(p)=12.5 MeV (5 levels given with deformation parameters).

1975RaYL: E(p)=12, 17 MeV.

1973Ta03: E(p)=30.5 MeV.

1973InZY: (p,p′γ) E(p)=13.8 MeV. Data for γ rays from 3^- level at 1910.

1973NaZS: E(p)=13.8 MeV.

1972Si05: (p,p) E(p)=20, 30, 50 MeV.

1972DiZR: E(p)=12 MeV.

1972Aw03: E(p)=14.7 MeV (24 levels given with L-values for nine levels). Deformation parameters given for many levels. The levels above 2500 are probably composite structures.

1972AnZP: (p,p′γ), E(p)=7.00, 8.10, 8.12 MeV. p-ce(t) data for γ rays from 695 level.

1971Hi08: E(p)=11-13 MeV.

1971Lu07: E(p)=15 MeV (10 levels given).

See 1992Pi08 for E4 transition moments, ratios of isovector to isoscalar matrix elements, fraction of energy weighted sum rule.

See 1990Pi14 for E1, E3 and E5 transition matrix elements, ratios of (p,p′) to (d,d′) matrix elements, and amplitude of two-phonon components.

A level at 800 reported by 1971Lu07 only (with L=(2), β_2=0.03) has been omitted due to lack of confirmation in any other study.

σ(integral) in milli-barn (1987Fr07)

Level	σ	Level	σ
0	1526	2516	1.52
535	29.0	2565	0.71
694	0.33	2610	1.23
1063	2.20	2658	0.40
1135	1.49	2740	0.43
1463	0.3	2812	0.9
1908	13.9	2838	1.0
2101	0.59	2931	0.8
2158	0.64	3000	0.6
2202	0.5	3050	0.95

2288	0.7	3296	0.37
2342	0.94	3365	0.5
2371	1.53		
2418	1.2		

^{100}Mo Levels

E(level)[†]	Jπ[#]	$T_{1/2}$	L[@]	β_L[‡]	Comments
0	0^+		0		
535 *2*	2^+		2	0.196 *15*	β_2: from 1992Ke07 based on reanalysis of data from 1987Fr07. Others: 0.250 *19* (1992Ke07, reanalysis of data from 1971Lu07), 0.202 (1987Fr07), 0.207 (1975Bu04), 0.184 (1973Ta03), 0.19 (1972Aw03), 0.23 (1971Lu07). G_2(W.u.)=27 *4* (1992Ke07, from β_2=0.196).
694 *2*	0^+	1.7 ns *2*	0		$T_{1/2}$: from (p)(ce)(t) (1972AnZP). See 1972Aw03 for deformation parameters. I(γ+ce)(695, E0 transition to g.s.)/I(γ+ce)(159γ, E2 to 535)=0.110 *8* (1972AnZP). This gives I(ce(K)(695,E0))/I(ce(K)(159γ,E2))=0.62 *5*. 1977Re04 report I(ce(K)(695,E0))/I(ce(K)(159γ,E2))=0.76 *5*.
1063 *2*	2^+		2	0.037	β_2: from 1987Fr07. Others: 1975Bu04, 1971Lu07.
1135 *2*	4^+		4	−0.020	β_4: −0.027 (1987Fr07). Other: 1975Bu04. B(E4)(W.u.)=0.99 *21* (1992Pi08).
1463 *2*	2^+		2	0.03	β_2: from 1971Lu07.
1510[ab] *2*	(0^+)		(0)		
1605?[&]			(2)		
1770[&] *5*			(2)		
1845[&] *5*					
1908 *2*	3^-		3	0.171	β_3: others: 0.200 *15*, 0.220 *17* (1992Ke07, from reanalysis of data of 1987Fr07 and 1971Lu07, respectively), 0.166 (1987Fr07), 1984Pi01, 1975Bu04, 1972Aw03, 1971Lu07. 1973InZY give Iγ(844γ)/Iγ(1373γ)=70/30 in (p,p′γ) data.
2040 *2*	0^+		0		E(level): 2032 (1987Fr07).
2046[&] *5*			2		
2070?[&] *5*			(3,5)		
2102 *2*	4^+		4	−0.0324	β_4: 0.037 (1984Pi01). B(E4)(W.u.)=2.96 *21* (1992Pi08).
2156 *2*	1^-		1		L: other: L=2 (1987Fr07,1984Pi01) for 2158 group. β_2=0.022 (1984Pi01). E(level): 2516 in 1992Pi08 is a misprint, see 1990Pi14.
2192?[&]					
2200 *2*	2^-				Jπ: assignment based on $\sigma(\theta)$ (1990Pi14,1987Fr07).
2285 *2*	2^+		2	0.018	β_2: from 1984Pi01.
2310[ab] *2*	6^+		6		
2339 *2*	5^-		5	0.014	L=2 (1987Fr07) for 2342 group, β_2=0.03 (1972Aw03).
2369 *2*	3^-		3	0.041	β_3=0.055 (1984Pi01).
2396 *2*	(1^-)		(1)		L=(3) (1987Fr07) for 2386 group.
2416 *2*	(4^+)		(4)	−0.0420	L=3 (1987Fr07) for 2418 group. β_3=0.06 (1972Aw03). B(E4)(W.u.)=5.1 *7* (1992Pi08).
2432[a] *2*	1^-		1		
2514 *5*	4^+		4	−0.0433	β_4: 0.053 (1984Pi01). B(E4)(W.u.)=5.7 *4* (1992Pi08). E(level): the 2470 group (1972Aw03) probably corresponds to 2514.
2527[ab] *5*	(2^+)		(2)		
2563 *5*	4^+		4	−0.0332	B(E4)(W.u.)=2.94 *19* (1992Pi08).
2607 *5*	5^-		5	0.034	
2628[ab] *5*	(2^+)		(2)		
2659 *5*	1^-		1		Jπ: 4^- (or 2^+) assigned to 2658 group by 1987Fr07 from $\sigma(\theta)$ data.
2725[ab] *5*					

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^{100}Mo(p,p′) 1992Pi08,1987Fr07 (continued)

^{100}Mo Levels (continued)

E(level)[†]	Jπ[#]	L[@]	β_L[‡]	Comments
2747 *5*	4^+	4	−0.0200	B(E4)(W.u.)=1.04 *12* (1992Pi08). L=2 (1987Fr07) for 2740 group.
2807 *5*	4^+	4	−0.0380	B(E4)(W.u.)=4.1 *9* (1992Pi08).
2827[ab] *5*	2^+	2		
2838?[&] *5*		(5)		E(level): 2838 group (1987Fr07) may correspond to 2827 and 2858 from 1992Pi08.
2858[a] *5*	3^-	3	0.010	
2901[a] *5*	4^+	4	−0.0115	B(E4)(W.u.)=0.36 *9* (1992Pi08).
2924[a] *5*	4^+	4	−0.0316	B(E4)(W.u.)=2.78 *25* (1992Pi08).
2933 *5*	4^+	4	−0.0200	B(E4)(W.u.)=1.09 *18* (1992Pi08). L=(3) (1987Fr07) for 2931 group.
2961[ab] *5*	2^+	2		
2984[ab] *5*	(6^+)	(6)		
2997 *5*	4^+	4	−0.0219	B(E4)(W.u.)=1.41 *31* (1992Pi08). L=3 (1987Fr07) for 3000 group.
3021[a] *5*	(4^+)	(4)	−0.0118	B(E4)(W.u.)=0.38 *7* (1992Pi08).
3041 *5*	5^-	5	0.027	E(level): 3050 (1987Fr07).
3068[a] *5*	5^-	5	0.019	
3085[a] *5*	4^+	4	−0.0122	B(E4)(W.u.)=0.42 *7* (1992Pi08).
3112 *5*	3^-	3	0.013	L=5 (1987Fr07) for 3122 group.
3140[ab] *5*	(1^-)	(1)		
3154[a] *5*	3^-	3	0.0045	
3172 *5*	3^-	3	0.025	L=2 (1987Fr07) for 3169 group.
3190[a] *5*	4^+	4	−0.0128	B(E4)(W.u.)=0.48 *6* (1992Pi08).
3217[a] *5*	1^-	1		
3237 *5*				
3265[a] *5*	3^-	3	0.0045	
3282[a] *5*	3^-	3	0.005	
3294 *5*	2^+	2		L=(3) (1987Fr07) for 3296 group.
3311[ab] *5*				
3324[ab] *5*				
3376 *5*	3^-	3	0.011	E(level)=3365, L=3 (1987Fr07).
3406[a] *5*	4^+	4	−0.0180	B(E4)(W.u.)=0.78 *14* (1992Pi08).
3421?[&] *5*		2		E(level): 3421 (1987Fr07) L=2, group may correspond to 3421 and 3437 from 1992Pi08.
3437[a] *5*	5^-	5	0.017	
3448[ab] *5*	(0^+)	(0)		
3468[ab] *5*	2^+	2		
3479 *5*	2^+	2		
3529[a] *5*	3^-	3	0.0043	
3537[ab] *5*	2^+	2		
3557 *5*	3^-	3	0.017	
3586[ab] *5*				
3595[ab] *5*	(3^-)	(3)		
3606 *5*	4^+	4	−0.0114	B(E4)(W.u.)=0.48 *9* (1992Pi08). L=(3,5) (1987Fr07) for 3605 group.
3623[ab] *5*				
3652 *5*	5^-	5	0.028	E(level): 3666 (1987Fr07).
3682[ab] *5*				
3718[a] *5*	4^+	4	−0.0129	B(E4)(W.u.)=0.46 *9* (1992Pi08).
3726[a] *5*	3^-	3	0.013	
3743 *5*	4^+	4	−0.0161	B(E4)(W.u.)=0.71 *14* (1992Pi08).

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^{100}Mo(p,p′) 1992Pi08,1987Fr07 (continued)

^{100}Mo Levels (continued)

E(level)[†]	Jπ[#]	L[@]	β_L[‡]	Comments
3747[a] 5	5⁻	5	0.016	
3773[a] 5	3⁻	3	0.019	
3797 5	4⁺	4	−0.0129	B(E4)(W.u.)=0.46 9 (1992Pi08). L=(3,5) for 3791 (1987Fr07).
3810[a] 5	(4⁺)	(4)	−0.0148	B(E4)(W.u.)=0.61 9 (1992Pi08).
3823[ab] 5	(5⁻)	(5)		
3894[ab] 5				
3915[ab] 5				
3925[ab] 5	(2⁺)	(2)		
3947[ab] 5				
4026[ab] 5	(3⁻)	(3)		
4043[ab] 5	(4⁺)	(4)		
4205[ab] 5	(2⁺)	(2)		
4243[ab] 5				

† From 1992Pi08, unless otherwise stated. Energy uncertainty is stated (1992Pi08) as 2 keV below 2.5 MeV and up to 5 keV above 2.5 MeV excitation.

‡ From 1992Pi08 for 4⁺ states and from 1990Pi14 for 3⁻ and 5⁻ states, unless otherwise specified. Sign of β_3 and β_5 is not given explicitly by 1990Pi14, assumed as positive (evaluators). B(E4)(W.u.) values (1992Pi08) are given under comments.

All assignments are from 1992Pi08. These are based on comparison of measured angular distributions with coupled-channel calculations (4⁺ states from 1992Pi08 and negative-parity states from 1990Pi14).

@ As implied from J^π values (L=spin) assigned by 1992Pi08 for J^π=4⁺ (1992Pi08), J^π=1⁻,3⁻ and 5⁻ (1990Pi14). Other L values are from 1987Fr07.

& From 1987Fr07 only.

a From 1992Pi08 only.

b Populated in (p,p′) and/or (d,d′); table 1 in 1992Pi08 gives a combined list of levels from two reactions.