^{89}Y(p,p′),(pol p,p′) 1975Hu11,1982Me02

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	NDS 114, 1 (2013)	20-Oct-2012

Includes (p,p), (pol p,p), (p,p′) IAR.

1975Hu11 (also 1973HuZU): (p,p′) E=20.51 MeV, FWHM≈0.05% and E=14.33 MeV, FWHM=7 to 8 keV, measured $\sigma(\theta)$; 107 levels reported between 2200 and 6004.

1982Me02: (pol p,p′): E=21.1 MeV. Measured $\sigma(\theta)$ and analyzing power, DWBA analysis. Levels up to 3137 studied. Microscopic description of first three excited states is investigated.

Others (levels, deformation parameters):

1969Sc25 (also 1970WhZY,1967Sc24): (p,p′) E=61 MeV. Measured $\sigma(\theta)$. 13 levels reported up to 4300.

1968Hi10: (p,p′) E=9.06, 9.98 MeV. FWHM=18 to 25 keV, measured proton spectra with a magnetic spectrograph, 28 levels reported up to 4240.

1968Cr09: (p,p′) E=10,12 MeV. Measured $\sigma(\theta)$. 16 levels reported up to 4226.

1968Be54: (p,p′) E=24.5 MeV. Measured $\sigma(\theta)$. Data for first six levels.

1967Aw02 (also 1966Aw01): (p,p′) E=14.7 MeV. Measured $\sigma(\theta)$. 15 levels reported up to 4452.

1967St13: (p,p′) E=19 MeV. 13 levels reported up to 4500.

1958Co73: (p,p′) E=23 MeV. Proton peaks reported at 1860, 2270, 2580, 2910 and 3860.

Others (reaction mechanism, potential parameters, IAR, etc.):

2009Sh19: E=200 MeV; measured $\sigma(\theta)$ for isoscalar giant quadrupole resonance at about 14 MeV excitation.

1997Ah08: (pol p,p) E=65 MeV. Measured $\sigma(\theta)$, Ay(θ), DWBA.

1994Ri01: (p,p′) E=120, 160, 200 MeV. Measured $\sigma(\theta)$, multistep reaction mechanism investigated.

1987PeZU: (pol p,p′) E=200.5 MeV. Measured $\sigma(\theta)$, Ay(θ).

1987Va01: (pol p,p) E=65 MeV.

1985Pl02, 1984Pl06: (pol p,p′) E=20 MeV. Measured $\sigma(\theta)$, Ay(θ) for first four states.

1982Sa37, 1982Sa19, 1979Sa38: (pol p,p) E=65 MeV. Measured $\sigma(\theta)$, Ay(θ).

1980DiZZ, 1979Di01: (p,p′) IAR, E=0.8 GeV. Measured $\sigma(\theta)$.

1979Di01: (p,p′) E=0.8 GeV. Measured $\sigma(\theta)$.

1978In03: (p,pol p′) E=185 MeV. Measured $\sigma(\theta)$, Ay(θ).

1975Sc06: (p,p′) E=8-15 MeV. Measured $\sigma(\theta)$.

1975Ma07: (p,p′) GQR, E=155 MeV. Measured $\sigma(\theta)$.

1975Ge14: (p,p′) IAR, E=5.9-6.3 MeV. Measured $\sigma(\theta)$.

1974Ro41: (p,p) E=4.8-6.4 MeV. Measured $\sigma(\theta)$.

1974Co09: (p,p) E=156 MeV.

1973Gr08: (pol p,p′) IAR.

1971Ma17: (pol p,p) E=49 MeV. Measured $\sigma(\theta)$.

1969Mi18: (p,p′) IAR, E=7.1-7.6 MeV. Measured $\sigma(\theta)$.

1969Be03: (p,p′) IAR, E=7.0-7.6 MeV. Measured $\sigma(\theta)$.

1968Lo04: (p,p′) IAR.

Additional information 1.

^{89}Y Levels

E(level)[†]	J$^\pi$[@]	L[‡]	β_L[#]	Comments
0	1/2$^-$			
908[b] 2	9/2$^+$	5+3[&]	0.055[a]	L: L=3, S=1 admixture is indicated by (pol p,p′) data (1985Pl02) and other microscopic (1982Me02,1978In03) analyses of this state. β_L: β_5. Others: 0.045 (1969Sc25), 0.060 (1968Be54), 0.07 (1967Aw02). At E(p)=185 MeV, β_5=0.042 or 0.034 (1978In03).
1507[b] 3	3/2$^-$	2+0[&]	0.060[a]	L: L=0, S=1 strong component is indicated by (pol p,p′) data (1985Pl02) and other microscopic (1982Me02,1978In03) analyses of this state. β_L: β_2. Others: 0.051 (1969Sc25), 0.064 (1968Be54), 0.08 (1967Aw02), 0.072 (1967St13).
1745[b] 3	5/2$^-$	2[&]	0.072[a]	L: no evidence is found for S=1 admixture in (pol p,p′) data (1985Pl02) and other

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^{89}Y Levels (continued)

E(level)†	Jπ@	L‡	β_L#	Comments
				microscopic (1982Me02,1978In03) analyses of this state.
				β_2=0.058 (1969Sc25), 0.066 (1968Be54), 0.08 (1967Aw02), 0.067 (1967St13).
2221 *5*	5/2+	3	0.156	β_3=0.221 (1982Me02), 0.14 (1969Sc25), 0.157 (1968Be54), 0.18 (1967Aw02), 0.16 (1967St13).
2530 *5*	7/2+	3	0.146	β_3=0.140 (1982Me02), 0.13 (1969Sc25), 0.152 (1968Be54), 0.17 (1967Aw02), 0.16 (1967St13).
2565 *5*	11/2+	5	0.027	Additional information 2.
2621 *5*	9/2+	5	0.047	β_5=0.055 (1969Sc25), 0.07 (1967Aw02).
2872 *5*	(7/2)+	3	0.111	β_3=0.12 (1969Sc25), 0.129 (1968Be54), 0.16 (1967Aw02).
2882 *5*	(3/2)−	2	0.066	β_2=0.142 (1982Me02).
2893 *5*				Jπ: tentatively identified (1975Hu11) as a (13/2+) state arising from coupling of a $p_{1/2}$ proton to $\pi g_{9/2}\pi p^{-1}_{3/2}$. Additional information 3.
3065 *5*	3/2−	2	0.013	
3105 *5*	(5/2)−	2	0.046	β_2=0.068 (1967Aw02).
3137 *5*	(5/2)−	2	0.033	β_2=0.050 (1982Me02).
3247 *5*				
3413 *5*				
3459? *5*				E(level): group reported by 1968Hi10 only.
3501 *5*				
3513 *5*	(3/2)−	2	0.016	
3555 *5*				
3629 *5*	(11/2)+	5	0.074	1967Aw02 gives L=0, β_0'=0.07.
3717 *5*	5/2+	3	0.095	β_3=0.140 (1967Aw02).
3750 *5*	(9/2)+	5	0.061	L: 3 (1967St13).
3852 *5*				
3863 *5*	(3/2,5/2)−	2*c*	0.052	β_2 for J=3/2, β_2=0.043 for J=5/2.
3924 *5*				
3975 *5*	(11/2)+	5	0.030	
3990 *5*	3/2−	2*c*	0.082	β_2=0.134 (1967Aw02).
4011 *5*				
4020 *5*	(3/2)−	2*c*	0.016	
4104 *5*				
4171 *5*	3/2−,5/2−	2*c*	0.093	β_2 for J=3/2, β_2=0.076 for J=5/2. Other: β_2=0.16 for J=3/2, 0.13 for J=5/2 (1967Aw02).
4188 *5*	5/2+	3	0.046	L: L=(4) allowed from (p,p′) but is inconsistent with L(^{3}He,d).
4230 *5*				
4251 *5*				
4304 *5*	(7/2)−	4	0.089	1967Aw02 gives L=3, β_3'=0.12.
4330 *5*				L: 3,4 for a 4320 group (1967St13).
4352 *5*				
4383 *5*				
4404 *5*				
4456 *5*	7/2−,9/2−	4	0.083	β_4 for J=7/2, β_4=0.074 for J=9/2.
4473 *5*	(5/2+)	(3)	0.057	
4489 *5*				L: 3,4 for a 4490 group (1967St13).
4508 *5*				
4526 *5*	5/2+,7/2+	3	0.034	β_3 for J=5/2, β_3=0.029 for J=7/2.
4536 *5*	3/2−,5/2−	2*c*	0.038	β_2 for J=3/2, β_2=0.031 for J=5/2.
4555 *5*	7/2−,9/2−	4	0.021	β_4 for J=7/2, β_4=0.019 for J=9/2.
4588 *5*	5/2+	3		L: L=(4) allowed from (p,p′) but is inconsistent with L(^{3}He,d).
4603 *5*	7/2−,9/2−	4	0.036	β_4 for J=7/2, β_4=0.032 for J=9/2.
4636 *5*				
4654 *5*				
4682 *5*				
4737 *5*		2*c*		
4770 *5*				

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^{89}Y(p,p′),(pol p,p′) 1975Hu11,1982Me02 (continued)

^{89}Y Levels (continued)

E(level)[†]	Jπ[@]	L[‡]
4785 *5*		
4817 *5*		
4831 *5*		
4849 *5*		2[c]
4862 *5*		
4888 *5*		
4907 *5*		
4927 *5*		
4954 *5*		
4973 *5*		
5006 *8*	(5/2)⁻	2[c]
5026 *8*		
5046 *8*		
5075 *8*		
5089 *8*		
5099 *8*		
5115 *8*		
5125 *8*		
5148 *8*		
5170 *8*		
5183 *8*		
5211 *8*		
5257 *8*		
5275 *8*		
5289 *8*		2[c]
5303 *8*		
5321 *8*		
5343 *8*		
5362 *8*		
5382 *8*		
5421 *8*		
5430 *8*		
5455 *8*		
5476 *8*		
5506 *8*		
5542 *8*		
5562 *8*		
5582 *8*		
5592 *8*		
5622 *8*		
5631 *8*		
5647 *8*		
5668 *8*		
5694 *8*		
5725 *8*		
5739 *8*		
5753 *8*		
5774 *8*		
5793 *8*		
5801 *8*		
5820 *8*		
5843 *8*		
5853 *8*		
5888 *8*		
5915 *8*		
5950 *8*		
5981 *8*		

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^{89}Y(p,p′),(pol p,p′) 1975Hu11,1982Me02 (continued)

^{89}Y Levels (continued)

E(level)[†]	L[‡]	β_L[#]	Comments
6004 *8*			
13.8×10^3 *2*	2	0.074 *1*	GQR from 1975Ma07. B(E2)(↑)=0.0445. Also in 2009Sh19.

† From 1975Hu11, unless indicated otherwise. Uncertainty=5 keV for E(level)<5000 and 8 keV for levels above this energy assigned (evaluator) on the basis of a general statement by 1975Hu11 that it varies from 3 keV to 8 keV. Energies for selected levels up to≈4400 are also available from 1968Hi10, 1968Cr09, 1967Sc24, 1967St13 and 1967Aw02.

‡ From DWBA analysis of $\sigma(\theta)$ (1975Hu11), unless stated otherwise. L-values for selected levels are also given by 1982Me02, 1969Sc25, 1968Be54, 1967St13 and 1967Aw02.

Deformation parameter $\beta_L=[d\sigma/d\Omega(exp)/d\sigma/d\Omega(DWBA)]^{1/2} \times [((2J_i+1)(2L+1))/(2J_f+1)]^{1/2}$, where J_i=1/2, J_f=level spin. Values are deduced from $\beta_L'=[d\sigma/d\Omega(exp)/d\sigma/d\Omega(DWBA)]^{1/2}$ given by 1975Hu11, unless indicated otherwise. The deformation parameters for selected low-lying states are also given by 1969Sc25, 1968Be54, 1967St13 and 1967Aw02.

@ From Adopted Levels.

& From 1982Me02 and 1985Pl02.

a From 1982Me02. Value of β_L' given by 1982Me02 is corrected for statistical factor.

b Energy from 1968Hi10.

c 1975Hu11 assign L=2 but state that $\sigma(\theta)$ shape differs from DWBA prediction which indicates presence of more structure-related effects.