

⁹⁰Zr(p,p') 1983Va03,1981Fu01

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

1983Va03: E=25.05 MeV. Measured $\sigma(\theta, E(p'))$, magnetic spectrograph, FWHM=12-16 keV, $\theta=9^\circ$ to 107° , enriched target.
 1981Fu01: E=65 MeV. Measured $\sigma(\theta, E(p'))$, magnetic spectrograph, FWHM=15 keV, $\theta=10^\circ-63^\circ$, enriched target.
 For other measurements of deformation parameters, see 1990Wa13, 1981Fu01, 1973Hi04, 1968Di05, 1967Ma14.
 Data are from 1983Va03 for levels below 6250 keV, from 1981Fu01 for levels above 6250 keV, except as noted.
 E=12.7 MeV, FWHM=40 keV (1968Di05).
 E=14.7 MeV (1967Ma14).
 E=24 MeV (1974Ce03).
 E=40: MeV, FWHM=20 keV (1973Hi04).
 E=61.2 MeV, FWHM \approx 45 keV (1972Wh03,1981Sc04).
 E=65 MeV, FWHM=15 keV (1981Fu10).
 E=65 MeV, FWHM=15 keV (1989Fu07).
 E=800 MeV, FWHM=170-230 keV (1979Di01).
 E=800 MeV, FWHM=70-100 keV (1982Ga02,1983Ga09).
 Experiments using polarized protons:
 E=20 MeV (1979PI01,1984PI06,1988PI04,1989PI09).
 E=20.3 MeV, FWHM=100-150 keV (1969GI05).
 E=30 MeV, FWHM=80-100 keV (1977De03).
 E=40 MeV, FWHM=60-80 keV (1979De11).
 E=57.5 MeV, FWHM=150-250 keV (1979Ma06).
 E=160 MeV, FWHM=80 keV (1980Sc21).
 E=185 MeV, FWHM=280-320 keV (1971Ha63).
 E=400 MeV, FWHM=120-300 keV (1989Le04,1989Le06).
 E=500 MeV (1987Ba22).
 E=800 MeV, FWHM=120 keV (1983Ba06).
 E=16 MeV (1994PIZZ, 1994PIZY).

⁹⁰Zr Levels

E(level) [†]	L [‡]	$\beta_L R^\ddagger$	Comments
0			
1756 4	0		
2185 4	2	0.45	
2319 4	5	0.45	
2751 4	3	1.02	
3078 4	4	0.27	
3311 5	2	0.28	
3455 5	6	0.20	
3596 5	8	0.14	
3846 5	2	0.32	
3962 5	5	0.38	
4062 5	4	0.16	
4128 5	0		
4233 5	(2,5)		E(level): unresolved doublet (1983Va03). L: L=5 from 1968Di05. 1983Va03 report L=2, $\beta R=0.23$, but state that L=2 alone cannot reproduce the $\sigma(\theta)$.
4305 6			
4338 [@] 6	4	0.36	E(level): suggested to be the 4 ⁺ member of the configuration= $((\nu 1g_{9/2})^{-1}(\nu d_{5/2}))$ multiplet (1981Fu10).
4380 6	7	0.45	
4427 6			
4462 [@] 6			E(level): suggested to be the 5 ⁺ member of the configuration= $((\nu 1g_{9/2})^{-1}(\nu d_{5/2}))$ multiplet

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⁹⁰Zr(p,p') 1983Va03,1981Fu01 (continued)

⁹⁰Zr Levels (continued)

<u>E(level)[†]</u>	<u>L^{†‡}</u>	<u>β_{LR}[†]</u>	<u>Comments</u>
			(1981Fu10).
4480 6			
4500 6	(3)	0.21	
4547 [@] 6	(2,6)		E(level): unresolved doublet (1983Va03). L: L=2 from 1968Di05. 1983Va03 report L=6, β _R =0.39. E(level): the 6 ⁺ state is suggested to belong to the configuration=((ν 1g _{9/2}) ⁻¹ (ν d _{5/2})) multiplet (1981Fu10).
4598 [@] 6			E(level): suggested to be the 3 ⁺ member of the configuration=((ν 1g _{9/2}) ⁻¹ (ν d _{5/2})) multiplet (1981Fu10).
4653 6			
4689 6	2	0.18	
4710 6	2	0.12	
4783 6			
4828 6	2	0.10	
4849 6			
4875 6			
4946 6			
4997 6	(2)		L: from 1968Di05.
5065 [@] 6			E(level): suggested to be the 7 ⁺ member of the configuration=((ν 1g _{9/2}) ⁻¹ (ν d _{5/2})) multiplet (1981Fu10).
5089 6			
5118 6	3	0.29	
5176 6			
5215 6	4	0.19	
5315 6	(4,5)		
5381 6	4	0.27	
5433 6	2	0.10	
5462 6	4	0.27	
5512 6	0,1		L: from 1974Ce03. Comparison of strength in (p,p') and (α,α') suggests natural parity.
5582 6			
5631 7	3	0.33	
5666 7	3	0.27	
5703 7			
5753 7			
5781 7	3	0.23	
5829 7			
5891 7	1		
5939 7	3	0.27	
5977 7	4	0.22	
6006 7	4	0.18	
6058 7	(4)		
6078 7			
6106 7			
6128 7			
6167 7	4	0.14	
6209 7	1		
6229 7			
6245 7			
6290	(3)		
6308 [#] 7	(4)		E(level): unresolved doublet (1983Va03).
6397 [#] 7	(3)		
6425 [#] 7	1		L: from 1983Va03.
6479	(3)		
6496 [#] 7			
6517	(4)		

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${}^{90}\text{Zr}(\text{p},\text{p}')$ 1983Va03,1981Fu01 (continued) ${}^{90}\text{Zr}$ Levels (continued)

<u>E(level)[†]</u>	<u>L^{†‡}</u>	<u>Comments</u>
6547 [#] 7		
6574 [#] 7		E(level): unresolved doublet (1983Va03).
6636 [#] 7		
6666	(4)	
6694	(4)	
6709	(3)	
6742	(3)	
6794 [#] 7		
6813	(4)	
6853	(4)	
6867	(3)	
6895	(4)	
6924 [#] 8		
6974	(3)	
7002	(3)	
7047	(3)	
7060	(4)	
7089	(3)	
7120	(3)	
7136 [#] 8		
7151	(4)	
7165 [#] 8		
7200	(3)	
7235	(3)	
7263	(3)	
7275	(4)	
7343 [#] 8		
7378 [#] 8		
7402	(3)	
7423	(3)	
7461	(3)	
7523	(4)	
7614	(3)	
7633	(3)	
7722	(3)	
7750	(3)	
7767	(4)	
7796	(4)	
7877	(4)	
7902	(3)	
7926	(4)	
7984	(4)	
8123	(3)	
8168	(3)	
8276	(3)	
8412	(3)	
8430	(3)	
8515	(3)	
8539	(3)	

[†] From 1983Va03 for levels below 6250 keV and from 1981Fu01 for levels above 6250 keV, except where noted. Energies of 1981Fu01 are systematically high and have been lowered by 15 keV by the evaluators. 1981Fu01 report an uncertainty of 5 keV.

${}^{90}\text{Zr}(\text{p,p}')$ [1983Va03](#), [1981Fu01](#) (continued)

${}^{90}\text{Zr}$ Levels (continued)

‡ Most of the parentheses on L values have been added by the evaluators.

From [1983Va03](#).

@ Configuration assignment from comparison of $\sigma(\theta)(\text{exp})$ with distorted wave calculations ([1981Fu10](#)).