

**<sup>89</sup>Y(pol d,p) 1993Mi04**

Type	Author	History	Citation	Literature Cutoff Date
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$J^\pi(^{89}\text{Y})=1/2^-$ .

**1993Mi04:** E=22 MeV. Measured E(p),  $\sigma(\theta)$ ,  $\theta=5^\circ - 70^\circ$ . Deduced cross-sections, analyzing powers, and angular momentum transfers. Detector: magnetic spectrometer with an energy resolution of 5-8 keV (FWHM).

All data are from **1993Mi04**, except where noted.

Other measurements:

**1972Go11:** E=33.3 MeV. Measured E(p),  $\sigma(\theta)$ ,  $\theta(\text{lab})=12.5^\circ-47.5^\circ$ . FWHM=25 keV.

**1969Ya01:** E=3.2-4.2 MeV. Measured E(p),  $\sigma(E(d),\theta)$ ,  $\theta=10^\circ$  to  $148^\circ$ . Surface-barrier detectors.

**1965Ha16:** E=15 MeV. Measured E(p),  $\sigma(\theta)$ , six angles  $8^\circ$  to  $85^\circ$ . FWHM=30-60 keV (**1965Ha16**).

**1964Wa14:** E=12 MeV. Measured E(p),  $\sigma(\theta)$ ,  $\theta=20^\circ$  to  $170^\circ$ , FWHM=10-15 keV.

**1968Mi04:** E=12.0 MeV. Measured E(p),  $\sigma(\theta)$ ,  $\theta=20^\circ$  to  $140^\circ$ , FWHM=16 keV.

**1966Bi07:** E=11.95 MeV. Measured E(p),  $\sigma(\theta)$ ,  $\theta(\text{c.m.})\approx 5^\circ$  to  $90^\circ$  FWHM $\approx 20$  keV (estimated by evaluators).

Magnetic spectrograph and nuclear emulsions were used in all measurements.

Others: **1965Ha16**, **1966Bi07**, **1969Ya01**, **1972Ya02**, **1973Mo27**, **1975Ya09**.

<sup>90</sup>Y Levels

E(level)	$J^\pi^\dagger$	L	S&	Comments
0.0 <sup>‡</sup>	2 <sup>-</sup>	2	2.25	L: from <b>1972Go11</b> .
202.5 <sup>‡</sup> /	3 <sup>-</sup>	2	2.95	L: from <b>1972Go11</b> .
1211.3 2	0 <sup>-</sup>	0	0.54	
1371.3 2	1 <sup>-</sup>	0	1.55	
1416.8 3	(2 <sup>-</sup> ),3 <sup>-</sup>	2	0.029	
1561.9 5	3 <sup>-</sup> ,4 <sup>-</sup>	4	0.11	
1571.4 4	2 <sup>-</sup> , (3 <sup>-</sup> )	2	0.045	
1640.6 3	1 <sup>-</sup>	0+2		S: 0.016 (L=0), 0.030 (L=2).
1760.8 2	2 <sup>-</sup>	2	0.11	
1810.6 2	(2 <sup>-</sup> ),3 <sup>-</sup>	2	0.23	
1962.1 2	5 <sup>+</sup> ,6 <sup>+</sup>	5	1.18	
2021.4 <sup>#</sup> 4				
2085.7 3	5 <sup>+</sup> ,6 <sup>+</sup>	5	0.22	
2133.2 <sup>#</sup> 9				
2179.4 7	(2 <sup>-</sup> ,3 <sup>-</sup> )	(2)	0.011	
2195.4 <sup>#</sup> 9				
2240.5 2	5 <sup>+</sup> ,6 <sup>+</sup>	5	1.65	
2327.4 <sup>#</sup> 4				
2365.6 3	1 <sup>-</sup>	0	0.069	
2475.9 2	2 <sup>-</sup>	2	1.92	
2504.6 3	2 <sup>-</sup>	2	0.12	
2520.9 5	5 <sup>+</sup> ,6 <sup>+</sup>	5	0.40	
2558.4 3	3 <sup>-</sup>	2+4		S: 0.012 (L=2), 0.24 (L=4).
2590.2 5	3 <sup>-</sup> ,4 <sup>-</sup>	4	0.10	
2624.2 2	1 <sup>-</sup>	2	0.98	
2663.1 <sup>#</sup> 7				
2678.1 4	3 <sup>-</sup>	2+4		S: 0.020 (L=2), 0.025 (L=4).
2702.6 5				
2745.9 5				
2755.4 3	3 <sup>-</sup>	2+4		S: 0.034 (L=2), 0.25 (L=4).
2784.6 3				
2819.7 3	1 <sup>-</sup>	0+2		S: 0.005 (L=0), 0.008 (L=2).
2847.3 2	1 <sup>-</sup>	0+2		S: 0.19 (L=0 or 2).

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$^{89}\text{Y}(\text{pol d,p})$  1993Mi04 (continued) $^{90}\text{Y}$  Levels (continued)

E(level)	$J^{\pi}$	L	S&	Comments
2858.9 4	$2^-, (3^-)$	2	0.040	
2870.4 2	$3^-, 4^-$	4	0.47	
2932.8 2	$3^-, 4^-$	4	2.12	
2992.4 2	$(1^-), 2^-$	2	0.35	
3002.3 2	$3^-, 4^-$	4	2.61	
3048.2 2	$3^-, 4^-$	4	1.56	
3119.5# 4				
3137.1 2	$3^-, 4^-$	4	0.61	
3160.2 2	$1^-$	0+2		S: 0.11 (L=0), 0.24 (L=2).
3203.9 4	$3^-, 4^-$	4	0.077	
3270.0 4				
3309.5 3	$3^-$	2+4		S: 0.005 (L=2), 0.037 (L=4).
3342.3@ 3		(1,5)		
3354.3@ 3		(2,5)		
3405.7 6	$(2^-), 3^-$	2	0.022	
3413.4 8				
3438.8 8				
3496.8 4	$(3^-)$	(2+4)		S: 0.011 (L=2), 0.020 (L=4).
3522.6 4	$5^+, 6^+$	5	0.33	
3534.4 5	$(5^+, 6^+)$	(5)	0.11	
3556.2 6				
3574.7 5	$1^-$	0+2		S: 0.020 (L=0), 0.004 (L=2).
3584.5 5				
3592.9 6	$5^+, 6^+$	5	0.13	
3602.1 5	$1^-$	0+2		S: 0.014 (L=0), 0.009 (L=2).
3627.5 6	$1^-$	0+2		S: 0.015 (L=0), 0.004 (L=2).
3644.2 5	$5^+, 6^+$	5	0.32	
3667.3# 8				
3692.7 6	$1^-$	0+2		S: 0.010 (L=0), 0.009 (L=2).
3736.1# 3				
3757.8 3				
3792.1 3	$3^-$	2+4		S: 0.017 (L=2), 0.039 (L=4).
3801.3 4	$(1^-)$	(0+2)		S: 0.005 (L=0), 0.011 (L=2).
3833.6# 4				
3858.7 3	$3^-$	2+4		S: 0.069 (L=2), 0.17 (L=4).
3881.4 3	$3^-$	2+4		S: 0.025 (L=2), 0.15 (L=4).
3907.2 4	$(1^-)$	(0+2)		S: 0.009 (L=0), 0.008 (L=2).
3934.6 4	$1^-$	0	0.026	
3942.5# 2				
3954.1# 4				
3972.3 7				
3980.4 3	$(3^-)$	(2+4)		S: 0.032 (L=2), 0.05 (L=4).
3996.4# 7				
4015.1 4	$(5^+, 6^+)$	(5)	0.088	
4024.2 3	$(3^-)$	(2+4)		S: 0.013 (L=2 and L=4).
4038.0 3	$(3^-)$	(2+4)		S: 0.005 (L=2), 0.017 (L=4).
4065.0@ 3		(2,5)		
4080.3# 4				
4100.0# 4				
4127.5 3	$1^-$	0+2		S: 0.049 (L=0), 0.015 (L=2).
4140.0# 8				
4158.8# 4				

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$^{89}\text{Y}(\text{pol d,p})$  1993Mi04 (continued) $^{90}\text{Y}$  Levels (continued)

E(level)	$J^{\pi\dagger}$	L	S&	Comments
4166.8@ 3		(2,5)		
4197.7 3	(2 <sup>-</sup> ,3 <sup>-</sup> )	(2)	0.010	
4219.7 3	(2 <sup>-</sup> )	2	0.024	
4288.6# 4				
4302.3@ 3				
4325.6 3	1 <sup>-</sup> ,2 <sup>-</sup>	2	0.012	
4341.2 3	5 <sup>+</sup> ,6 <sup>+</sup>	5	0.25	
4352.8# 4				
4377.9 3	1 <sup>-</sup>	0+2		S: 0.025 (L=0), 0.009 (L=2).
4411.3 4	(5 <sup>+</sup> ,6 <sup>+</sup> )	(5)	0.037	
4425.7 3	(5 <sup>+</sup> ,6 <sup>+</sup> )	(5)	0.040	
4482.1 3	(5 <sup>+</sup> ,6 <sup>+</sup> )	(5)	0.097	
4504.7 3	5 <sup>+</sup> ,6 <sup>+</sup>	5	0.19	
4518.8 4	1 <sup>-</sup> ,2 <sup>-</sup>	2	0.010	
4532.9 4	(1 <sup>-</sup> ),2 <sup>-</sup>	2	0.013	
4548.0# 4				
4558.5 5	(0 <sup>-</sup> ,1 <sup>-</sup> )	(0)	0.022	
4572.0 4	(2 <sup>-</sup> )	2	0.012	
4587.3# 5				
4619.5# 5				
4636.8 5	(5 <sup>+</sup> ,6 <sup>+</sup> )	(5)	0.12	
4645.4# 11				
4656.1 7	(5 <sup>+</sup> ,6 <sup>+</sup> )	(5)	0.07	
4662.8 6	3 <sup>-</sup>	2+4		S: 0.015 (L=2), 0.043 (L=4).
4672.6 7	3 <sup>-</sup>	2+4		S: 0.006 (L=2), 0.020 (L=4).
4685.8 7	1 <sup>-</sup>	0+2		S: 0.015 (L=0), 0.009 (L=2).
4694.2@ 7				
4713.0 7	5 <sup>+</sup> ,6 <sup>+</sup>	5	0.095	
4725.4# 18				
4735.2# 8				
4749.4# 8				
4777.1# 10				
4784.7 9	3 <sup>-</sup> ,4 <sup>-</sup>	4	0.045	
4802.9# 10				
4814.7# 11				
4822.7# 11				
4835.4@ 10		(2,5)		
4865.9 12	5 <sup>+</sup> ,6 <sup>+</sup>	5	0.055	
4881.4@ 12		(2,5)		
4895.4 13	(2 <sup>-</sup> )	2	0.011	
4914.8 13	(1 <sup>-</sup> ,2 <sup>-</sup> )	(2)	0.019	
4927.3# 15				
4940.1 14	(3 <sup>-</sup> )	(2+4)		S: 0.014 (L=2), 0.036 (L=4).
4953.2 15	(1 <sup>-</sup> )	(0+2)		S: 0.015 (L=0), 0.007 (L=2).
4971.2 16	5 <sup>+</sup> ,6 <sup>+</sup>	5	0.082	
4986.0 16	(0 <sup>-</sup> ,1 <sup>-</sup> )	(0)	0.018	
4997.9 25	2 <sup>-</sup> ,3 <sup>-</sup>	2	0.009	

<sup>†</sup> Spin and parity assignments are based on angular momentum transfers and analyzing powers.

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 ${}^{89}\text{Y}(\text{pol d,p})$  [1993Mi04](#) (continued) ${}^{90}\text{Y}$  Levels (continued)

‡ Cross-sections measured at two angles only.

# Peak not well resolved or has poor statistics.

@ Multiplet with several L-transfer values.

& S-factors defined as  $S = [d\sigma/d\Omega]_{\text{exp}} / [d\sigma/d\Omega]_{\text{DWBA}}$ , with the cross-section values taken at first maximum of the angular distribution. DWBA calculations performed using the CHUCK3 code ([1993Mi04](#)).