

$^{40}\text{Ar}(\text{p,p}'),(\text{pol p,p}')$ 1988B104,1985De03,1961Ka26

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 140, 1 (2017)	30-Sep-2015

Includes (p,p), (pol p,p).

1988B104: (p,p') E=0.8 GeV proton beams was produced from the Los Alamos Clinton P. Anderson Meson Physics Facility (LAMPF). Target was natural argon gas. Scattered ions were analyzed with the high-resolution spectrometer (HRS) (FWHM=140 keV). Measured $\sigma(\theta)$. Deduced levels, J, π , L-transfer, deformation parameters from DWBA analysis.

1985De03: (p,p') E=29.6, 35.1 MeV proton beams were produced from the Milan AVF cyclotron. Target was gaseous argon. Scattered particles were detected with three telescopes of surface-barrier silicon detectors (FWHM=80-120 keV). Measured $\sigma(\theta)$. Deduced levels, J, π , L-transfer, deformation parameters, transition strengths from coupled-channel analysis and DWBA analysis.

1961Ka26: (p,p') E=8 MeV. 23 levels reported with precise energies.

1968Jo14: (p,p') E=24.85 MeV. Measured $\sigma(\theta)$. Deduced levels, J, π , deformation parameters from DWBA analysis.

1965Gr11: (p,p') E=14.1, 16.9 MeV. Measured $\sigma(\theta)$. Deduced levels, J, π , deformation parameters from DWBA analysis.

1961Be32: (p,p') E=7.3, 9.4 MeV. 21 levels reported.

Others.

2007Ok01: (p,p') E=25.1, 32.5, 40.7 MeV. Measured $\sigma(\theta)$, analyzing powers.

1992Go18: (p,p) E=1.875-1.879 MeV. Measured yield.

1983Ba01: (p,p') E=1 GeV. Measured total σ .

1983Ok01: (pol p,p) E=25.1, 32.5, 40.7 MeV. Measured analyzing powers.

1982Sa19, 1982Sa37, 1979Sa38, 1978Sa33: (pol p,p) E=65 MeV. Measured analyzing powers.

1980Fa06, 1980Fa07: (p,p) E=20.9-44.1 MeV. Measured $\sigma(\theta)$.

1977Bi09: (p,p) E=1.093, 0.992 MeV. Measured σ .

1973Be41: (pol p,p) E=40 MeV. Measured analyzing powers.

1971Ru04: (pol p,p') E=49.4 MeV. Measured $\sigma(\theta)$, analyzing powers. 5 levels at 1460, 2530, 2910, 3230 and 3710 studied.

1969Ba23: (pol p,p) E=21 MeV. Measured $\sigma(\theta)$, analyzing powers.

1966Hu05, 1966Hu12: (p,p') E=4.1, 7.3 MeV. Measured $\sigma(\theta)$.

1964Bo27: (pol p,p) E=14.5 MeV. Measured $\sigma(\theta)$.

1962Ta05: (p,p') E=6.14 MeV. Measured $\sigma(\theta)$ for three levels.

1962An04: (p,p') E=14.8 MeV.

1961Ba29: (p,p') E=0.8-3.5 MeV. Measured $\sigma(\theta)$.

1961Ro13, 1961Ro05: (pol p,p) E=8, 10 MeV. Measured $\sigma(\theta)$.

1961Co29: (p,p) E=1-2 MeV.

1960Od01: (p,p') E=7.6-14.2 MeV. Measured $\sigma(\theta)$ for gs and 1460 peak. Two other peaks seen at 3700 and 4800.

1958Ty47: (p,p') E=185 MeV. Measured $\sigma(\theta)$.

1957Gi14: (p,p') E=9.5 MeV.

1956Ei15: (p,p') E=8.5, 9.0, 9.8 MeV. Measured $\sigma(\theta)$.

1956Va28: (p,p').

1956Bu95: (p,p) E=9.5 MeV.

1956Ki54: (p,p) E=14.5, 20, 31.5 MeV. Measured $\sigma(\theta)$.

1954Fr43: (p,p') E=9.5 MeV. Measured $\sigma(\theta)$.

1947He02: (p,p') E=9.2 MeV, levels reported at 1500 and 2400.

[Additional information 1.](#)

 ^{40}Ar Levels

B(EL) values from [1985De03](#) correspond to different nuclear models (rotational or vibrational) and to different choice of low-lying levels in coupled-channel (CC) calculations. Known γ -ray branching ratios and lifetimes were used in the analysis. The negative sign for some of these values is that of the corresponding matrix element. See full details in [1985De03](#).

Multiple values of deformation parameters and transition probabilities B(EL) arise from choice of different nuclear models and to selection of low-lying levels used in the analysis.

$^{40}\text{Ar}(p,p'),(\text{pol } p,p')$ 1988B104,1985De03,1961Ka26 (continued) ^{40}Ar Levels (continued)

E(level) [†]	L [@]	$\beta_{L,R}$ (fm) ^{&}	Comments
0	0		
1462 2	2	0.95	$\beta_2=0.242\ 5$ or $0.220\ 4$ (1985De03), $0.24\ 2$ or $0.26\ 2$ (1971Ru04), 0.21 (1968Jo14). B(E2)(from g.s.)= $0.046\ 8$, $0.0459\ 19$, $0.0448\ 20$, $0.0430\ 10$, $0.0441\ 10$, $0.0447\ 10$ (1985De03). L: from 1985De03. Other: ≤ 2 (1965Gr11), 1 (1968Jo14).
2125 3	0		$\beta_1=0.05$ for L=1 (1968Jo14). $\beta_0=0.032\ 8$ or $-0.029\ 8$ (1985De03). Additional information 2.
2529 3	2	0.28	B(E2)(from 1460,2 ⁺)= $0.0046\ 17$, $0.00078\ 14$, $0.00014\ 4$ (1985De03). L: other: (0),1 (1965Gr11). $\beta_2=0.33\ 3$ (1985De03), 0.05 (1968Jo14). B(E2)(from g.s.)= $0.0039\ 7$, $0.00350\ 2$, $0.0024\ 2$ (1985De03). Additional information 3.
2897 5	4	0.32	B(E2)(from 1460,2 ⁺)= $0.0011\ 2$, $0.00013\ 11$, $0.00006\ 14$ (1985De03). B(E4)(from 1460,2 ⁺)= $0.0000048\ 12$, $0.000079\ 8$, $0.000047\ 41$ (1985De03). B(E2)(from 2120,0 ⁺)= $0.097\ 9$, $0.23\ 4$ (1985De03). $\beta_4=0.107\ 12$ or $0.078\ 7$ (1985De03), 0.11 (1968Jo14). B(E4)(from g.s.)= $0.00113\ 6$, $0.00077\ 11$, $0.00080\ 5$ (1985De03). B(E2)(from 1460,2 ⁺)= $0.024\ 4$, $0.0040\ 1$, $0.0054\ 22$, $0.014\ 4$ (1985De03). B(E4)(from 1460,2 ⁺)= $0.000294\ 13$, 0 , $0.00063\ 37$, $0.00005\ 9$ (1985De03).
3213 5	2	0.22	$\beta_2=0.07$ (1968Jo14). B(E2)(from g.s.)= $0.0010\ 3$ (1985De03). B(E2)(from 1460,2 ⁺)= $0.0014\ 5$ (1985De03). B(E4)(from 1460,2 ⁺)= $0.00040\ 34$ (1985De03).
3518 5	(2)	0.17	$\beta_3=0.07$ for L=3 (1968Jo14). E(level),L, $\beta_{L,R}$ (fm): complex structure (1988B104), known levels at 3512, 4 ⁺ and 3464, 6 ⁺ may be included in the peak at 3510. The angular distribution (in 1988B104) for 3510 does not agree with that expected for L=2.
3688 5	3	1.00	$\beta_3=0.26\ 3$ (1985De03,1968Jo14), $0.29\ 2$ or $0.31\ 2$ (1971Ru04). B(E3)(from g.s.)= $0.0150\ 5$ (DWBA), $0.0165\ 3$ (CC) (1985De03). B(E2)(from 1460,2 ⁺)= $0.0038\ 10$ (1985De03). B(E5)(from 1460,2 ⁺)= $0.000035\ 17$ (1985De03).
3926 6	2	0.22	$\beta_2=0.07$ (1968Jo14). B(E2)(from g.s.)= $0.0024\ 2$ (1985De03). B(E2)(from 1460,2 ⁺)= $0.0065\ 29$ (1985De03). B(E4)(from 1460,2 ⁺)= $0.00105\ 17$ (1985De03).
4053 7			
4092 7			
4240 7			
4310 7	(2,3)		L: from 1968Jo14. $\beta_2=0.07$, $\beta_3=0.08$ (1968Jo14).
4348 11			
4430 7	3	0.44	L: other: (2) (1965Gr11). $\beta_4=0.19$ for J=4 (1968Jo14).
4484 8			
4581 7			
4612 9			
4683? 10			
4775? 10			
4808 10			
4880 9	(4)		L: from 1965Gr11. Other: (2,3,4) from 1968Jo14.
4941 10			
5004 12			
5280 [‡] 20			
5410	(5)	0.24	L, $\beta_{L,R}$ (fm): 0.22 for L=4 (1988B104). J ^π : 1 ⁻ in Adopted Levels for the 5400.5 level.
5460 [‡] 20			

Continued on next page (footnotes at end of table)

$^{40}\text{Ar}(p,p'),(\text{pol } p,p')$ 1988BI04,1985De03,1961Ka26 (continued) ^{40}Ar Levels (continued)

<u>E(level)[†]</u>	<u>L[@]</u>	<u>$\beta_{L,R}$ (fm)^{&}</u>	<u>Comments</u>
5695 [#] 33			
5900 [‡] 20	3	0.32	$\beta_4=0.10$ for J=4 (1968Jo14).
6130 [‡] 20	(2)	0.22	$\beta_2=0.08$ (1968Jo14). J ^π : no assignment in Adopted Levels. L, $\beta_{L,R}$ (fm): 0.25 for L=3 (1988BI04).
6270 [#] 33			
6475 [#] 42			
6650 [#] 24			
7300 [‡] 20			

[†] From 1961Ka26, unless otherwise noted. Most values seem to be systematically higher by 4-10 keV than the precisely known values in Adopted Levels adopted from other measurements and they are not considered in Adopted Levels unless there are no other data available.

[‡] From 1968Jo14.

[#] From 1961Be32.

[@] From 1988BI04, unless otherwise noted. Same values are also from 1985De03, 1968Jo14 and 1965Gr11 for some of the levels.

[&] Deformation length from 1988BI04, with $R=r_0A^{1/3}$.