^{31}P(p,p′)   1968An24,1971Ka58,1966Li02

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen and Balraj Singh	NDS 184, 29 (2022)	24-Jun-2022

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

1968An24, 1968An25, 1968An27: E=5.9 MeV protons from the U120 cyclotron at the Gosudarstvennyi University, Russia. Semiconductor spectrometer to measure protons scattered from ^{31}P. Measured $\sigma(\theta)$ for three levels and compared with Hauser-Feshbach calculations.

1971Ka58: E=185 MeV beam from the University of Uppsala synchro-cyclotron. Measured $\sigma(E_p,\theta)$ at θ(lab)=4°−40° with a magnetic spectrometer. Deduced levels, J, π, relative transition strengths. DWIA analysis. Comparisons with available data.

1966Li02: E=155 MeV protons from Orsay accelerator. Magnetic double focusing spectrometer and plastic scintillators for measuring proton spectra and angular distributions. (θ_{lab})= 8°−35°. FWHM=750 keV.

Elastic scattering experiments (optical model parameters determined from $\sigma(\theta)$ and Ay(θ) measurements):

1989Vo05: (pol p,p) E=72 MeV, measured $\sigma(\theta)$, Ay(θ).

1983Ch50: E=1-10 MeV. Measured $\sigma(\theta)$.

1980Fa07: E=29.7 MeV. Measured $\sigma(\theta)$, deduced β_2.

1988Za04: E=6 MeV. Measured integral σ.

1999Sa16: E=1.0-4.1 MeV. Measured thick target γ-ray yields of 1266γ.

1990Bo15: E=3.2-3.6 MeV. Measured γ-ray yields.

1985Ki07: E=2.4-4.2 MeV. Measured thick target γ-ray yields.

1978Sa33: (pol p,p) E=65 MeV. Measured $\sigma(\theta)$, Ay(θ).

1968Cr03: (p,p′) E=17.5 MeV. Measured $\sigma(\theta)$.

1961Ko08: (p,p′) E=6.54, 6.95, 7.10, 7.35 MeV. Measured $\sigma(\theta)$.

1961Co29: (p,p′) E=1.0-2.0 MeV. Measured yields.

^{31}P Levels

Deformation parameter β_L from model independent analysis of scattering cross section.

E(level)[†]	J$^\pi$	dσ/dΩ(max) (mb/sr)[c]	Comments
0	1/2^{+}[&]		
1265	3/2^{+}[&]	3.4 *3*	B(E2)↑=0.0097 *20* (1966Li02) E(level): other: 1270 *30* (1971Ka58). β_2=0.31 (1980Fa07), 0.20 (1968An27 for 1265+2232 group). dσ/dΩ_{max}(c.m.)=2.3 *2* mb/sr (1971Ka58).
2232	5/2^{+}[&]	5.8 *6*	B(E2)↑=0.0165 *40* (1966Li02) E(level): other: 2220 *30* (1971Ka58). dσ/dΩ_{max}(c.m.)=4.4 *2* mb/sr (1971Ka58).
3133	(3/2^{+})[@]		J$^\pi$: 1/2^{+} in Adopted Levels.
3292	(3/2,5/2,7/2^{-})[@]		J$^\pi$: 5/2^{+} in Adopted Levels.
3414	(7/2^{+})[@]		E(level): other: 3440 *40* (1971Ka58) for 3410+3510. dσ/dΩ_{max}(c.m.)=0.39 *6* (E4) or 1.20 *8* (E2) mb/sr (1971Ka58).
3505	(3/2,5/2,7/2)[@]	2.1 *2*	J$^\pi$: 3/2^{+} in Adopted Levels.
4370[#] *40*			E(level): could be a composite peak of 4260+4430+4590. dσ/dΩ_{max}(c.m.)=1.6 *3* mb/sr (1971Ka58).
4.6×10^3[‡] *1*	(5/2^{-})[a]	3.0 *3*	B(E3)↑=0.0025 *8* (1966Li02) E(level),J$^\pi$: no 5/2^{-} level between 4500 and 4700 is reported in other studies. This broad group and B(E3) are not included in Adopted Levels.
4740[#] *50*			dσ/dΩ_{max}(c.m.)=1.03 *16* mb/sr (1971Ka58).
5310[#] *60*	(9/2^{+})[b]		dσ/dΩ_{max}(c.m.)=0.67 *8* mb/sr (1971Ka58).

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^{31}P(p,p′)   **1968An24,1971Ka58,1966Li02 (continued)**

^{31}P Levels (continued)

E(level)[†]	J$^\pi$	dσ/dΩ(max) (mb/sr)[c]	Comments
5.6×10^{3}[‡] *1*	(7/2$^-$)[a]	3.0 *3*	B(E3)↑=0.0025 *8* (1966Li02)
			E(level),J$^\pi$: no 7/2$^-$ level between 5500 and 5700 is reported in other studies. This broad group and B(E3) are not included in Adopted Levels.
5630[#] *40*	(5/2$^-$)[b]		dσ/dΩ_{max}(c.m.)=1.6 *3* mb/sr (1971Ka58).
6360[#] *40*	(7/2$^-$)[b]		dσ/dΩ_{max}(c.m.)=0.81 *16* mb/sr (1971Ka58).
6690[#] *80*	(11/2$^-$)[b]		dσ/dΩ_{max}(c.m.)=0.16 *3* mb/sr (1971Ka58).
7030[#] *60*	(9/2$^-$)[b]		dσ/dΩ_{max}(c.m.)=0.54 *12* (E3) or 0.16 *3* (E5) mb/sr (1971Ka58).
7130[#] *60*			dσ/dΩ_{max}(c.m.)=1.1 *3* mb/sr (1971Ka58).
7840[#] *50*			dσ/dΩ_{max}(c.m.)=0.39 *3* mb/sr (1971Ka58).
8700[#] *80*	(1/2$^+$,3/2$^+$)[b]		dσ/dΩ_{max}(c.m.)=1.5 *3* mb/sr (1971Ka58).
10.80×10^{3}[#] *10*	(1/2$^+$,3/2$^+$)[b]		dσ/dΩ_{max}(c.m.)=1.0 *2* mb/sr (1971Ka58).

[†] From 1968An24, unless otherwise stated.
[‡] From 1966Li02.
[#] From 1971Ka58.
[@] From analysis of integral and differential cross section data (1968An24).
[&] From Adopted Levels.
[a] From analysis of $\sigma(\theta)$ in 1966Li02.
[b] Suggested by 1971Ka58 based on comparisons of measured $\sigma(\theta)$ with theoretical calculations.
[c] From 1966Li02.