^{31}P(α,p),(α,n):resonances 1964Ku12,1971Mc23,1975Sc40

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen, John Cameron and Balraj Singh	NDS 112,2715 (2011)	20-Oct-2011

1964Ku12: ^{31}P(α,p), E_α=1.7-3.3 MeV alpha beam produced from the Utrecht Van de Graaff accelerator. A zinc phosphide target prepared by evaporation of Zn_3P_2 onto solid copper backings, thickness 40-500 mg/cm^2. Five silicon surface barrier counters at 87°, 120°, 135°, 150° and 172° for detecting protons. Measured resonance yield, $\sigma(E_\alpha,\theta)$. Deduced resonance energies, J^π and resonance widths.

1970Um01: ^{31}P(α,n), E_α=6.3-7.9 MeV alpha beam produced from the Florida State University Tandem Van de Graaff accelerator. A Ca_3P_2 target evaporated onto 0.025 mm Al foil, thickness 80 keV. plastic scintillator (NE102) for detecting positrons from ^{34}Cl decay; a 15 cm^3 Ge(Li) detector for detecting a 2.127 MeV γ-ray in ^{34}S following the decay. Measured $\sigma(E_\alpha,\theta)$. Deduced level energies and isospin for resonance states of 12.9 and 13.9 MeV.

1971Mc23: ^{31}P(α,p), E_α=3.25-5.25 MeV alpha particles beam produced from the 5.5 MeV Van de Graaff accelerator of the Southern Universities Nuclear Institute. A Zn^3P_2 target evaporated onto carbon backings. Detectors: four solid state detectors for detecting protons. Measured $\sigma(E_\alpha,\theta)$. Deduced resonance levels (E_x=9.9-11.7 MeV), J^π.

1975Sc40: ^{31}P(α,p), E_α=3.25-5.55 MeV alpha particles beam produced from the 5.5 MV Van de Graaff accelerator of the University of Lowell. A 10 keV thick target prepared by evaporated natural ^{31}P onto carbon backings. Four silicon surface-barrier detectors for detecting protons. Measured $\sigma(E_\alpha,\theta)$. Deduced resonance levels (E_x=9.9-11.8 MeV), J^π.

^{35}Cl Levels

$(2J+1)\Gamma_\alpha\Gamma_p/\Gamma$: from 1964Ku12 before E_x=9951, others from 1971Mc23.

E(level)[†]	J$^\pi$[‡]	E_α (lab)	Comments
9127 *9*	5/2[#]	2404[#] *10*	$(2J+1)\Gamma_\alpha\Gamma_p/\Gamma$=0.16 ev.
9160 *4*	1/2[#]	2442[#] *4*	$(2J+1)\Gamma_\alpha\Gamma_p/\Gamma$=1.6 ev.
9256 *4*	1/2[#]	2550[#] *4*	$(2J+1)\Gamma_\alpha\Gamma_p/\Gamma$=2.6 ev.
9400 *9*	1/2[#]	2712[#] *10*	$(2J+1)\Gamma_\alpha\Gamma_p/\Gamma$=0.6 ev.
9456 *4*	3/2[#]	2776[#] *4*	$(2J+1)\Gamma_\alpha\Gamma_p/\Gamma$=2.8 ev.
9481 *2*	3/2[#]	2804[#] *2*	$(2J+1)\Gamma_\alpha\Gamma_p/\Gamma$=18 ev.
9551 *6*	5/2[#]	2883[#] *7*	$(2J+1)\Gamma_\alpha\Gamma_p/\Gamma$=1.9 ev.
9673 *6*	1/2[#]	3021[#] *7*	$(2J+1)\Gamma_\alpha\Gamma_p/\Gamma$=1.1 ev.
9713 *3*	1/2[#]	3066[#] *3*	$(2J+1)\Gamma_\alpha\Gamma_p/\Gamma$=41 ev.
9751 *3*	7/2[#]	3109[#] *3*	$(2J+1)\Gamma_\alpha\Gamma_p/\Gamma$=7.6 ev.
9814 *3*	5/2[#]	3180[#] *3*	$(2J+1)\Gamma_\alpha\Gamma_p/\Gamma$=20 ev.
9870 *3*	1/2[#]	3243[#] *3*	$(2J+1)\Gamma_\alpha\Gamma_p/\Gamma$=46 ev.
9901 *3*	(1/2,3/2)	3278[b] *3*	J$^\pi$: 1/2 from 1975Sc40 and 3/2 from 1964Ku12. $(2J+1)\Gamma_\alpha\Gamma_p/\Gamma$=38 ev.
9923 *4*	3/2$^-$	3303[b] *4*	J$^\pi$: from 1975Sc40. $(2J+1)\Gamma_\alpha\Gamma_p/\Gamma$=80 ev.
9951 *5*	3/2[&]	3335[&] *5*	$(2J+1)\Gamma_\alpha\Gamma_p/\Gamma$=34 ev.
9968	(1/2,3/2)[@]	3354[@]	$(2J+1)\Gamma_\alpha\Gamma_p/\Gamma$=17 ev.
10031 *5*	(1/2$^+$,3/2$^-$)[&]	3425[&] *5*	$(2J+1)\Gamma_\alpha\Gamma_p/\Gamma$=124 ev.
10058	3/2[@]	3425[@]	$(2J+1)\Gamma_\alpha\Gamma_p/\Gamma$=40 ev.
10075	(1/2)[@]	3475[@]	$(2J+1)\Gamma_\alpha\Gamma_p/\Gamma$=52 ev.
10089 *5*	5/2$^+$[&]	3490[&] *5*	$(2J+1)\Gamma_\alpha\Gamma_p/\Gamma$=63 ev.
10133 *5*	3/2$^-$[&]	3540[&] *5*	$(2J+1)\Gamma_\alpha\Gamma_p/\Gamma$=165 ev.
10168 *5*	(3/2$^-$,5/2$^-$)[&]	3580[&] *5*	$(2J+1)\Gamma_\alpha\Gamma_p/\Gamma$=26 ev.

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^{31}P(α,p),(α,n):resonances 1964Ku12,1971Mc23,1975Sc40 (continued)

^{35}Cl Levels (continued)

E(level)†	Jπ‡	E_α (lab)	Comments
10217 5	3/2&	3635& 5	(2J+1)$\Gamma_\alpha\Gamma_p/\Gamma$=63 ev.
10235 5	3/2−&	3655& 5	(2J+1)$\Gamma_\alpha\Gamma_p/\Gamma$=271 ev.
10278	1/2@	3704@	(2J+1)$\Gamma_\alpha\Gamma_p/\Gamma$=15 ev.
10295	@	3723@	
10319 5	5/2+&	3750& 5	Jπ: 5/2 from 1971Mc23 and (5/2+,7/2−) from 1975Sc40. (2J+1)$\Gamma_\alpha\Gamma_p/\Gamma$=63 ev.
10340	(3/2,5/2)@	3774@	(2J+1)$\Gamma_\alpha\Gamma_p/\Gamma$=50 ev.
10359 5	3/2&	3795& 5	(2J+1)$\Gamma_\alpha\Gamma_p/\Gamma$=155 ev.
10385	@	3825@	
10398 5	3/2+&	3840& 5	Jπ: (1/2, 3/2) from 1971Mc23 and (3/2+,7/2+) from 1975Sc40. (2J+1)$\Gamma_\alpha\Gamma_p/\Gamma$=61 ev.
10431 5	5/2+&	3877& 5	(2J+1)$\Gamma_\alpha\Gamma_p/\Gamma$=66 ev.
10465 5	5/2+&	3915& 5	(2J+1)$\Gamma_\alpha\Gamma_p/\Gamma$=211 ev.
10485 5	5/2+&	3938& 5	(2J+1)$\Gamma_\alpha\Gamma_p/\Gamma$=76 ev.
10536 5	1/2+&	3995& 5	Jπ: 1/2 from 1971Mc23 and (1/2+,5/2+) from 1975Sc40. (2J+1)$\Gamma_\alpha\Gamma_p/\Gamma$=182 ev.
10589 5	3/2+&	4055& 5	(2J+1)$\Gamma_\alpha\Gamma_p/\Gamma$=71 ev.
10641 5	5/2+&	4114& 5	(2J+1)$\Gamma_\alpha\Gamma_p/\Gamma$=272 ev.
10677 5	(3/2+,5/2+)&	4155& 5	Jπ: 3/2 from 1971Mc23 and (3/2+,5/2+) from 1975Sc40. (2J+1)$\Gamma_\alpha\Gamma_p/\Gamma$=132 ev.
10698 5	7/2−&	4178& 5	(2J+1)$\Gamma_\alpha\Gamma_p/\Gamma$=100 ev.
10735 5	3/2+&	4220& 5	Jπ: 3/2 from 1971Mc23 and (3/2+,9/2+) from 1975Sc40. (2J+1)$\Gamma_\alpha\Gamma_p/\Gamma$=269 ev.
10762 5	(3/2+,7/2−)&	4250& 5	
10801 5	5/2+&	4295& 5	(2J+1)$\Gamma_\alpha\Gamma_p/\Gamma$=238 ev.
10817 5	3/2−&	4313& 5	Jπ: 3/2 from 1971Mc23 and (1/2+,3/2−) from 1975Sc40.
10844 5	3/2−&	4343& 5	(2J+1)$\Gamma_\alpha\Gamma_p/\Gamma$=923 ev.
10870	(5/2,7/2)@	4372@	(2J+1)$\Gamma_\alpha\Gamma_p/\Gamma$=137 ev.
10886	@	4390@	
10910 5	(3/2+,5/2−)&	4418& 5	
10928	7/2@	4438@	(2J+1)$\Gamma_\alpha\Gamma_p/\Gamma$=231 ev.
10942	@	4454@	
10963 5	5/2+&	4477& 5	(2J+1)$\Gamma_\alpha\Gamma_p/\Gamma$=181 ev.
10973	@	4489@	
10998 5	(3/2+,7/2−)&	4517& 5	Jπ: (5/2) from 1971Mc23. (2J+1)$\Gamma_\alpha\Gamma_p/\Gamma$=172 ev.
11034 5	3/2+&	4558& 5	(2J+1)$\Gamma_\alpha\Gamma_p/\Gamma$=218 ev.
11063 5	(1/2+,9/2+)&	4590& 5	
11083 5	(5/2+,9/2+)&	4613& 5	
11105	@	4638@	
11123 5	3/2&	4658& 5	
11142 5	5/2+&	4680& 5	
11154	@	4693@	
11169	@	4710@	
11178 5	(3/2−,5/2+)&	4720& 5	
11185	@	4728@	

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^{31}P(α,p),(α,n):resonances 1964Ku12,1971Mc23,1975Sc40 (continued)

^{35}Cl Levels (continued)

E(level)[†]	J$^{\pi}$[‡]	E_{α} (lab)	Comments
11195 *5*	3/2[&]	4740[&] *5*	
11230	[@]	4779[@]	
11244 *5*	3/2[&]	4795[&] *5*	
11262 *5*	3/2^{-}[&]	4815[&] *5*	
11287	[@]	4843[@]	
11307	[@]	4866[@]	
11313 *5*	(1/2^{-},5/2^{+})[&]	4873[&] *5*	
11328 *5*	(1/2^{-},5/2^{+})[&]	4890[&] *5*	
11357	[@]	4922[@]	
11374	[@]	4942[@]	
11390	[@]	4960[@]	
11410	[@]	4982[@]	
11421 *5*	3/2^{-}[&]	4995[&] *5*	
11434	[@]	5009[@]	
11459	[@]	5038[@]	
11470 *5*	(1/2^{-},5/2^{-})[&]	5050[&] *5*	
11492	[@]	5075[@]	
11504 *5*	(3/2^{-},5/2^{-})[&]	5088[&] *5*	
11525	[@]	5112[@]	
11540	[@]	5129[@]	
11550 *5*	(3/2^{-},5/2^{+})[&]	5140[&] *5*	
11565	[@]	5157[@]	
11589	[@]	5184[@]	
11607 *5*	(5/2^{+},7/2^{-})[&]	5205[&] *5*	
11629 *5*	(1/2^{+},5/2^{+})[&]	5230[&] *5*	
11637	[@]	5239[@]	
11651	[@]	5254[@]	
11684 *5*	(1/2^{+},5/2^{+})[&]	5292[&] *5*	
11773 *5*	(3/2^{-},7/2^{-})[&]	5392[&] *5*	
11783 *5*	3/2^{-}[&]	5403[&] *5*	
12900			T=3/2
13900[a]			T=3/2

[†] From $E_x=E_{cm}+Q_{\alpha}$, where E_{cm} is deduced from E_{α} and Q_{α}=6997.89 *4* for ^{35}Cl (2011AuZZ).
[‡] From the comparison of the experimental angular distributions with theoretical predictions (1964Ku12, 1971Mc23 and 1975Sc40).
[#] From 1964Ku12, unless otherwise noted.
[@] From 1971Mc23, unless otherwise noted.
[&] From 1975Sc40, unless otherwise noted.
[a] From 1970Um01.
[b] Weighted average from 1964Ku12 and 1975Sc40.