

$^{74}\text{Ge}(\text{p},\text{d})$ 1975ShYV,1973Fo01

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen		NDS 158, 1 (2019)	16-May-2019

$J^\pi(^{74}\text{Ge g.s.})=0^+$.

1975ShYV: E=35 MeV proton beam was produced from the MSU cyclotron. Target was 175 $\mu\text{g}/\text{cm}^2$ GeO_2 (94.48% enriched in ^{74}Ge). Reaction products were momentum-analyzed with an Enge split-pole magnetic spectrograph (FWHM $\approx$ 8 keV) and detected in nuclear emulsions. Measured $\sigma(\theta)$, $\theta=6^\circ-60^\circ$. Deduced levels, J, π , L-transfers, spectroscopic factors from DWBA analysis. Comparisons with available data.

1973Fo01: E=20 MeV proton beam was produced from the Chalk River MP tandem accelerator. Targets were 20-85 $\mu\text{g}/\text{cm}^2$ metal Ge or the oxide (94.5% enriched in ^{74}Ge) evaporated onto 15 $\mu\text{g}/\text{cm}^2$ carbon foils. Reaction products were detected with a counter telescope consisting of three silicon detectors (FWHM=30-40 keV). Measured $\sigma(\theta)$, $\theta=15^\circ-65^\circ$. Deduced levels, J, π , L-transfers, spectroscopic factors from DWBA analysis.

Cross-section data (1973Fo01)

Level	$(\text{d}\sigma/\text{d}\Omega)_{\text{max}}$ (mb/sr)
0	0.92
63	1.85
370	6.95
494	0.45
557	0.12
897	0.50
1039	1.13
1139	0.14
1186	0.14
1261	0.25
1312	0.34
1610	0.15
1653	0.07
1744	0.09
2030	0.30
2122	0.17
2270	0.07
2329	0.16

 ^{73}Ge Levels

Spectroscopic factor C^2S is extracted using the relation: $(\text{d}\sigma/\text{d}\Omega)_{\text{exp}} = \text{N} \times \text{C}^2\text{S} \times (\text{d}\sigma/\text{d}\Omega)_{\text{DWBA}}$, where $\text{N}=2.29$ is the normalization factor for (p,d) reaction.

$\text{E}(\text{level})^\dagger$	L°	$\text{C}^2\text{S}^\&$	Comments
0	4	3.39	C^2S : other: 3.35 for L=4 for a possible doublet at E=0 (1973Fo01).
13 2	2	0.23	C^2S : other: 0.21 for L=2 for a possible doublet at E=0 (1973Fo01).
66 2	1	0.59	E(level): other: 63 5 (1973Fo01). C^2S : for J=1/2. Other: 0.56 (1973Fo01).
353 2	3	2.94	E(level): other: possible doublet at 370 5 (1973Fo01). C^2S : other: 2.58 for L=3 at E=370 5 (1973Fo01).
364 2	1	1.14	E(level): other: possible doublet at 370 5 (1973Fo01). C^2S : other: 2.03 for L=1 at E=370 5 (1973Fo01).

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$^{74}\text{Ge}(\text{p,d})$ 1975ShYV,1973Fo01 (continued) ^{73}Ge Levels (continued)

E(level) [†]	L [@]	C ² S ^{&}	Comments
392 2	1	0.96	C ² S: for J=1/2 (1975ShYV).
500 2	2	0.18	E(level): other: possible doublet at 494 5 (1973Fo01).
			L,C ² S: other: S=0.08 for L=1, J=1/2 ⁻ ; S=0.12 for L=2, J=5/2 (1973Fo01).
554 2	0	0.02	E(level),L,C ² S: other: 0.06 for E=557 15 with L=2, J=5/2 (1973Fo01), but it is possible that impurity was not subtracted out correctly (see 1975ShYV).
598 2	3	0.12	
778 2	2	0.01	E(level): other: 730 20 (1973Fo01), but it may be an impurity; see 1975ShYV.
809 2	3	0.11	E(level): other: 810 15 (1973Fo01).
827 5			
895 2	1	0.11	E(level): other: 897 5 (1973Fo01).
			C ² S: for J=1/2. Other: 0.19 (1973Fo01).
911 2	2	0.06	Weakly populated (1975ShYV).
934? 5			
1026? 5			
1044 2	1	0.44	E(level),C ² S: other: 0.45 for E=1039 5 (1973Fo01).
1133 3	3(+1)	0.14+0.02	E(level): possible doublet (1975ShYV). Other: 1139 5 (1973Fo01).
			L: other: 3 (1973Fo01).
			C ² S: for J=5/2 and 1/2. Other: 0.64 (1973Fo01).
1153 3	3	0.62	
1192 [#] 3	3+4	0.29+0.25	E(level),L: other: 3 for E=1186 5 (1973Fo01).
			C ² S: for J=5/2 and 9/2. Other: 0.62 for L=3 (1973Fo01).
1265 3	1	0.08	E(level),C ² S: other: 0.12 for E=1261 5 (1973Fo01).
1311 5	1	0.13	E(level),C ² S: other: 0.17 for E=1312 5 (1973Fo01).
1528 4	3	0.14	
1611 [#] 7	3+4	0.39+0.21	E(level),L,C ² S: other: 0.78 for E=1610 10, L=3, J=5/2 (1973Fo01).
1635 5	2	0.05	E(level),L,C ² S: other: C ² S=0.07 for E=1653 15 with L=1 and J=3/2 (1973Fo01), but it may be an impurity; see 1975ShYV.
1744 5	0	0.01	E(level),L,C ² S: other: C ² S=0.06 for E=1744 15 with L=2 and J=5/2 (1973Fo01); the discrepancy in L transfer could be accounted for by the poor statistics and not being resolved from the weak peak of 1756 level (see 1975ShYV).
1756 5			
2036 5	1	0.14	E(level),C ² S: other: 0.18 for E=2030 10 (1973Fo01).
2101 5	(2)	0.1	L: poor fit to $\sigma(\theta)$ distribution (1975ShYV).
2131 5	1	0.05	E(level),C ² S: other: 0.11 for E=2122 10 (1973Fo01).
2145 5	2	0.02	
2185 5	1	0.01	
2267 7	1	0.05	E(level): other: 2270 15 (1973Fo01).
			L,C ² S: from 1973Fo01.
2335 5	1	0.06	E(level),C ² S: other: 0.10 for E=2329 10 (1973Fo01).
2462 7			
2482 7	1	0.04	
2508 7	1	0.04	
2564 7	1	0.03	
2678 7	1	0.01	
2696 7	1	0.02	
2743 7	2	0.01	
2796 7	3	0.14	
2831 7			
3017 7	1	0.01	
3037 7	1	0.02	
3058 7	1	0.01	
3172 7	1	0.02	
3356 7	1	0.02	
3384 7			

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$^{74}\text{Ge}(\text{p,d})$ [1975ShYV](#), [1973Fo01](#) (continued) ^{73}Ge Levels (continued)

<u>E(level)[†]</u>	<u>L[@]</u>	<u>C²S^{&}</u>	<u>E(level)[†]</u>	<u>L[@]</u>	<u>E(level)[†]</u>
3623 [‡] 10	1+3	0.01+0.03	3945 7		4437 7
3631 7			4000 7	(1+4)	4569 7
3703 7			4059 7		4601 7
3805 [‡] 10			4073 7		4653 7
3924 7	1	0.01	4370 7		4667 7

[†] From [1975ShYV](#). Data are also available in [1973Fo01](#) for some levels, as given under comments, but are less precise and complete.

[‡] Doublet ([1975ShYV](#)).

[#] $\sigma(\theta)$ indicates probable doublet ([1975ShYV](#)).

[@] From DWBA fit to measured differential cross section ([1975ShYV](#)). Data are also available in [1973Fo01](#) for some levels and are consistent with those quoted here from [1975ShYV](#), unless otherwise noted.

[&] From [1975ShYV](#), with uncertainties estimated to be about 20%. Values from [1973Fo01](#) are given under comments. Except where noted, the following J^π values, mainly from shell-model considerations, have been adopted in extracting C²S from DWBA analysis in [1975ShYV](#) and [1973Fo01](#): $J^\pi=3/2^-$ for L=1, $5/2^+$ for L=2⁺, $5/2^-$ for L=3 and $9/2^+$ for L=4.