^{76}Se(^{3}He,d) 1983Zu01,1978Kl10,2009Ka06

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	ENSDF	30-Sep-2020

1983Zu01: E=24 MeV. $\sigma(\theta)$ from 5° to 60° (lab). Energy resolution=18-25 keV. Uncertainty in cross sections ≈10%. DWBA calculations used in assigning L transfers. See also 1981ZuZX from the same group.

1978Kl10: E=41 MeV. $\sigma(\theta)$ from 6° to 38° (lab). Energy resolution=40 keV. DWBA calculations. See also 1978KlZT from the same group.

2009Ka06 (data details in 2008KaZT): E=73 MeV beam provided by the AVF cyclotron at RCNP, Osaka. Enriched target. The outgoing deuterons were detected and analyzed with Grand Raiden magnetic spectrograph, with an angular aperture of ±1.1°. FWHM=18 keV. Measured precise absolute cross sections and relative cross sections where these are maximum for the relevant L transfer, angular distributions. Spectroscopic factors were deduced from analysis of cross section data by DWBA calculations using PTOLEMY code and six different sets of optical-model potential parameters and two bound-state potential parameters. Uncertainty in cross sections: statistical uncertainty of 1% for strong peaks; systematic uncertainties of 5% in absolute values and 3% in relative values. Multiplets have larger uncertainties.

Several single-particle transfer reactions were studied by 2009Ka06 to map out the occupancies of valence proton orbitals in the ground states of ^{74}Ge, ^{76}Ge, ^{76}Se and ^{78}Se by precise measurements of absolute cross sections and relative cross sections at the angles where these are maximum in angular distributions.

^{77}Br Levels

Measured cross sections from 2008KaZT and 2009Ka06 are listed under comments. Some of these cross section were used by 2009Ka06 to deduce the spectroscopic factors. Systematic uncertainties are 5% in absolute values and 3% in relative values. Statistical uncertainties are 1% for strong peaks, and larger for multiplets.

E(level)[†]	L[&]	(2J+1)C^{2}S[c]	Comments
0.0	1[b]	0.42[e]	dσ/dΩ (mb/sr)=1.93 (4.5°), 0.68 (8°), 0.38 (12°). (2J+1)C^{2}S: for $p_{3/2}$ from σ at 4.5°. Others: 0.35 (1983Zu01), 0.146 (1978Kl10).
105.8 *14*	4[b]	2.72[e]	dσ/dΩ (mb/sr)=4.23 (4.5°), 4.05 (8°), 2.93 (12°). (2J+1)C^{2}S: for $g_{9/2}$ from σ at 12°. Others: 2.1 (1983Zu01). 1978Kl10 give L=3, S=1.22, 2.14 for a level at 114 that may be a composite of 106 and 130 levels.
130.2 *20*	2	0.33[d]	(2J+1)C^{2}S: for $d_{5/2}$.
162[@]	3[b]	1.75[e]	dσ/dΩ (mb/sr)=2.82 (4.5°), 2.84 *34* (8°), 1.45 (12°). (2J+1)C^{2}S: from σ at 8°. L,(2J+1)C^{2}S: others: 0.52, 0.44 for L=1 and 2.06 for L=3, $f_{5/2}$ (1983Zu01); 0.107, 0.18 for L=1 and 0.84, 1.46 for L=3 (1978Kl10).
167[@]	1[b]	0.69[e]	dσ/dΩ (mb/sr)=3.17 *38* (4.5°), 0.83 (8°), 0.63 (12°). L,(2J+1)C^{2}S: see comment for 162 level. Spectroscopic factor from σ at 4.5°.
227.2 *14*	1[b]	0.18[e]	dσ/dΩ (mb/sr)=0.82 (4.5°), 0.25 (8°), 0.18 (12°). L: 1 in 1983Zu01, confirmed in 2008KaZT. 1978Kl10 give L=1+3 with corresponding S factors. (2J+1)C^{2}S: for $3/2^-$ from σ at 4.5°. Others: 0.119, 0.102 (1983Zu01), 1978Kl10.
277.0[#] *25*			
337.3 *14*	1[b]	0.61[e]	dσ/dΩ (mb/sr)=2.80 (4.5°), 0.90 (8°), 0.62 (12°). (2J+1)C^{2}S: from σ at 4.5°. Others: 0.70, 0.60 (1983Zu01); 0.17, 0.29 (1978Kl10).
425.6 *14*	3[b]	0.36[e]	dσ/dΩ (mb/sr)=0.56 (4.5°), 0.59 (8°), 0.36 (12°). (2J+1)C^{2}S: for $f_{5/2}$ from σ at 8°. Others: 0.44 (1983Zu01); 0.18, 0.31 (1978Kl10).
473.2 *15*	1[b]	0.026[e]	dσ/dΩ (mb/sr)=0.12 (4.5°), 0.039 (8°), 0.036 (12°). (2J+1)C^{2}S: for $3/2^-$ from σ at 4.5°. Other: 0.020, 0.018 (1983Zu01).
578.6 *16*	(3)[a]	0.049,0.086[a]	
647.3 *16*	3[b]	0.054[e]	dσ/dΩ (mb/sr)=0.092 (4.5°), 0.093 (8°), 0.072 (12°). L: (3) in 1978Kl10, L=3 confirmed in 2008KaZT.

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^{76}Se(^{3}He,d) 1983Zu01,1978Kl10,2009Ka06 (continued)

^{77}Br Levels (continued)

E(level)†	L&	(2J+1)C^{2}S^c	Comments
			(2J+1)C^{2}S: for 5/2$^-$ from σ at 8°. Others: 0.035, 0.061 (1978Kl10).
774.6 *15*	(0)	0.042[d]	L,(2J+1)C^{2}S: other: L=3 and S=0.12, 0.21 (1978Kl10).
835.1 *16*	1[b]	0.15[e]	dσ/dΩ (mb/sr)=0.67 (4.5°), 0.23 (8°), 0.14 (12°). (2J+1)C^{2}S: from σ at 4.5°. (2J+1)C^{2}S: others: 0.116, 0.101 (1983Zu01); 0.037, 0.066 (1978Kl10).
889.9 *15*	1[b]	0.11[e]	dσ/dΩ (mb/sr)=0.51 (4.5°), 0.21 (8°), 0.14 (12°). (2J+1)C^{2}S: from σ at 4.5°. (2J+1)C^{2}S: others: 0.105, 0.091 (1983Zu01); 0.032, 0.057 (1978Kl10).
972.1 *16*	2(+4)	0.070,0.054[d]	dσ/dΩ (mb/sr)=0.24 (4.5°), 0.17 (8°), 0.10 (12°). E(level): most likely a doublet. see Adopted Levels for details. L: (2+4) in 1983Zu01, L=2 in 2008KaZT but no other data details. (2J+1)C^{2}S: for L=2; 0.079, 0.042 for L=4 (1983Zu01).
1028.1 *17*	2	0.089,0.07[d]	(2J+1)C^{2}S: other: 0.013, 0.020 (1978Kl10).
1122.6 *16*	(3)[a]	0.093,0.16[a]	
1138.9 *24*			
1239.9 *15*	4[b]	0.14[e]	dσ/dΩ (mb/sr)=0.29 (4.5°), 0.25 (8°), 0.17 (12°). (2J+1)C^{2}S: from σ at 12°. Other: 0.20, 0.105 (1983Zu01).
1275.5 *15*	3	0.19[d]	(2J+1)C^{2}S: for $f_{5/2}$. Other: 0.15, 0.26 for L=3 (1978Kl10).
1362.6 *15*	(3)[a]	0.059,0.102[a]	
1393.2 *23*	1	0.011,0.01[d]	
1462.2 *15*	(0)	0.007[d]	
1484.3 *21*	(4)	0.23,0.12[d]	
1554.1 *16*			
1577.1 *18*	(3)[a]	0.103,0.18[a]	
1604.4# *23*			
1651.5 *15*	2	0.014,0.011[d]	L,(2J+1)C^{2}S: 1978Kl10 deduce L=(1+3) and S=0.003, 0.006 for L=1 and S=0.014, 0.024 for L=3.
1716.4 *18*			
1746.3 *15*	4[b]	0.70[e]	dσ/dΩ (mb/sr)=1.35 (4.5°), 1.17 (8°), 0.89 (12°). L: 4 in 1983Zu01; L=4 confirmed in 2008KaZT. L=(3) in 1978Kl10 is discrepant. (2J+1)C^{2}S: from σ at 12°. Others: 1.24, 0.66 (1983Zu01); 0.64, 1.12 for L=(3) (1978Kl10).
1774.0 *17*	2	0.047,0.037[d]	
1789.1 *23*			
1855.1 *15*	(0)	0.059[d]	L,(2J+1)C^{2}S: 1978Kl10 deduce L=(3) and S=0.18, 0.32.
1879?	(3)[a]	0.106,0.18[a]	Level not reported by 1983Zu01, unless this level is the same as the L=4, 1908 level reported by 1983Zu01.
1907.6 *15*	4[b]	0.064[e]	dσ/dΩ (mb/sr)=0.162 (4.5°), 0.104 (8°), 0.082 (12°). (2J+1)C^{2}S: from σ at 12°. Other: 0.15, 0.082 (1983Zu01). See also comment for 1879 level.
1998.8 *15*	1	0.029,0.025	L,(2J+1)C^{2}S: 1978Kl10 deduce L=(1+3) with S=0.020, 0.035 for L=1 and S=0.052, 0.089 for S=3.
2018.9 *19*	2	0.046,0.036[d]	
2131.5‡ *15*	1[b]	0.069[e]	dσ/dΩ (mb/sr)=0.30 (4.5°), 0.21 (8°), 0.15 (12°). L: (1) in 1983Zu01, L=1 confirmed in 2008KaZT. (2J+1)C^{2}S: from σ at 4.5°. Other: 0.014, 0.012 (1983Zu01).
2149.9‡ *18*	1[b]	0.026[e]	dσ/dΩ (mb/sr)=0.11 (4.5°), 0.040 (8°), 0.030 (12°). (2J+1)C^{2}S: from σ at 4.5°. L: (1) in 1983Zu01, L=1 confirmed in 2008KaZT. 1978Kl10 report a level at 2142 with L=3, which is probably a composite of 2132 and 2150 levels reported by 1983Zu01. (2J+1)C^{2}S: other: 0.020,0.017 (1983Zu01).
2172.4‡ *20*	(2)	0.008,0.00[d]	

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^{76}Se(^{3}He,d) 1983Zu01,1978Kl10,2009Ka06 (continued)

^{77}Br Levels (continued)

E(level)[†]	L[&]	(2J+1)C^{2}S[c]	Comments
2224.0[#] *15*	1[b]	0.053[e]	dσ/dΩ (mb/sr)=0.23 (4.5°), 0.065 (8°), 0.042 (12°). L: (1) in 1983Zu01, L=1 confirmed in 2008KaZT. (2J+1)C^{2}S: from σ at 4.5°. Other: 0.033, 0.029 (1983Zu01).
2248.3[#] *19*	(2)	0.034,0.027[d]	
2274.7[‡] *19*	(1)	0.034,0.029[d]	
2296.7[‡] *15*	(2)	0.18,0.14[d]	

[†] From 1983Zu01, unless otherwise stated.
[‡] Part of an unresolved group (1983Zu01).
[#] Weakly populated.
[@] 162 and 167 groups are unresolved, angle-to-angle ratios of cross sections used to assign separate cross sections. See details of the fitting procedures for unresolved peaks in 2008KaZT. Energy of the composite is given as 165.1 *14* in 1983Zu01.
[&] From 1983Zu01, unless otherwise stated. Disagreements between 1983Zu01 and 1978Kl10 are noted. Evaluator has given L-values in parentheses for unresolved or weakly populated groups and for the cases where deduced values disagree between 1983Zu01 and 1978Kl10.
[a] Values from 1978Kl10 only.
[b] L-value confirmed in 2008KaZT, 2009Ka06.
[c] When two values are given either in the data field or in comments, these correspond to L-1/2 and L+1/2, respectively. Disagreements between 1983Zu01 and 1978Kl10 are noted. 1983Zu01 state that S(L-1/2) and S(L+1/2) from 1978Kl10 may be reversed to get a better agreement.
[d] From 1983Zu01, uncertainty is ≈10%.
[e] From 2008KaZT, uncertainty is ≈5%.