^{64}Zn(pol d,t) 2013Le19

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 196,17 (2024)	30-Sep-2023

The current version of this dataset is adopted from the XUNDL dataset compiled by E. Thiagalingam and B. Singh (McMaster), on June 13, 2013.

2013Le19: E=22 MeV polarized deuteron beam was provided by the MP tandem Van de Graaff accelerator at the Maier-Leibnitz-Laboratorium (MLL) of Ludwig-Maximilians-Universitat (LMU) and Technische Universitat Munchen (TUM) in Garching, Germany. Target was 126 μg/cm^2 *6* ^{64}Zn (99.3% *1* enriched). Reaction products were momentum-analyzed with the Munich Q3D magnetic spectrograph (FWHM≈8 keV) and detected with a cathode-strip focal-plane detector. Measured triton spectra, $\sigma(\theta)$ with $\theta_{c.m.}$=10° to 60°, vector analyzing powers. Deduced levels, J, π, L-transfers, C^{2}S from. DWBA analysis. Deuteron optical-model parameters were determined from analysis of (pol d,d) data at 22 MeV. These parameters were compared with four other sets in literature. Table I in 2013Le19 lists the optical parameters used for deuterons and tritons. Comparison with shell-model calculations.

1983En02: E=12.4 MeV tensor-polarized deuteron beam was from the University of Birmingham Radial Ridge cyclotron. Targets were 98.5% enriched 2.0 and 1.0 mg/cm^2 self-supporting ^{64}Zn. Reaction products were detected with 4 silicon ΔE-E detector telescopes. Measured $\sigma(\theta)$, analyzing powers. Deduced J, π, L-transfer for the g.s. from DWBA analysis.

1977Br27,1977Br28: E=13 MeV vector-polarized deuteron beam was from the University of Wisconsin Lamb-shift polarized-ion source and tandem accelerator. Target was 0.75 mg/cm^2 metallic Zn (99.38% enriched in ^{64}Zn). Reaction products were detected with 4 detector telescopes (FWHM=45 keV). Measured $\sigma(\theta)$, analyzing powers. Deduced J, π, L-transfers, spectroscopic factors for g.s., 190, 250 levels from DWBA analysis.

Other:

1960Ze02: (d,t) E=21.6 MeV from the Argonne 60-inch cyclotron. Measured $\sigma(\theta)$.

All data are from 2013Le19.

^{63}Zn Levels

The dσ/dΩ values under comments are measured at 30° in 2013Le19, unless otherwise noted.

Spectroscopic factor C^{2}S is defined by dσ/dΩ(exp)=N×C^{2}S×dσ/dΩ(DWBA)/(2j+1), where N=3.33 is the normalization factor and j is the angular momentum of transferred particle (2013Le19).

E(level)[†]	J$^\pi$[‡]	L[#]	C^{2}S[#]	Comments
0	3/2$^-$	1	0.991 *22*	C^{2}S: other: 1.00 (1977Br27). dσ/dΩ=2.27 mb/sr *17*.
192.94[@] *12*	5/2$^-$	3	1.404 *33*	C^{2}S: other: 1.73 (1977Br27). dσ/dΩ=299 μb/sr *22*.
247.8[@] *2*	1/2$^-$	1	0.090 *2*	C^{2}S: other: 0.12 (1977Br27). dσ/dΩ=199 μb/sr *15*.
627.06[@] *5*	1/2$^-$	1	0.188 *4*	dσ/dΩ=434 μb/sr *31*.
636.83[@] *16*	3/2$^-$	1	0.135 *3*	dσ/dΩ=337 μb/sr *24*.
650.6[@] *5*	5/2$^-$	3	0.056 *2*	dσ/dΩ=13.0 μb/sr *17*.
1023.70[@] *2*	3/2$^-$	1	0.0575 *14*	dσ/dΩ=154 μb/sr *11*.
1063.73[&] *7*	1/2$^-$	1	0.0036 *6*	dσ/dΩ=69 μb/sr *5* for doublet.
1063.73[&] *7*	7/2$^-$	3	0.153 *6*	
1206.54[@] *10*	7/2$^-$	3	0.115 *3*	dσ/dΩ=34 μb/sr *3*.
1284.2[@] *2*	5/2$^-$	3	0.0095 *6*	dσ/dΩ=2.1 μb/sr *5*.
1394.71[@] *10*	3/2$^-$	1	0.0208 *6*	dσ/dΩ=58 μb/sr *4*.
1435.37[@] *14*				dσ/dΩ=6.3 μb/sr *9*.
1664.93[@] *2*	7/2$^-$	3	0.254 *9*	dσ/dΩ=71 μb/sr *5*.
1678.0 *2*		3		dσ/dΩ=2.1 μb/sr *8*.
1690.67[@] *18*	5/2$^-$	3	0.0214 *15*	dσ/dΩ=4.7 μb/sr *5*.

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^{64}Zn(pol d,t) 2013Le19 (continued)

^{63}Zn Levels (continued)

E(level)[†]	Jπ[‡]	L[#]	C^{2}S[#]	Comments
1702.66[@] *6*		1+3		dσ/dΩ=28 μb/sr *2*.
1862.5 *4*				dσ/dΩ=0.5 μb/sr *2*.
1901.48 *11*	1/2$^-$	1	0.0193 *7*	dσ/dΩ=57 μb/sr *4*.
1909.18 *10*	3/2$^-$	1	0.0054 *3*	dσ/dΩ=10.6 μb/sr *13*.
1978.24 *5*	(9/2$^+$)	(4)	0.0128 *10*	dσ/dΩ=3.9 μb/sr *5*.
2050.9 *7*				dσ/dΩ=0.4 μb/sr *2*.
2157.74[@] *11*	3/2$^-$	1	0.0100 *3*	dσ/dΩ=26 μb/sr *2*.
2213.6 *2*				dσ/dΩ=1.8 μb/sr *3*.
2236.8 *7*				dσ/dΩ=0.3 μb/sr *2*.
2250.4 *5*				dσ/dΩ=1.5 μb/sr *3*.
2262.0[@] *3*	1/2$^-$	1	0.00152 *12*	dσ/dΩ=4.5 μb/sr *5*.
2288.42 *5*	7/2$^-$	3	0.0228 *9*	dσ/dΩ=10.2 μb/sr *9*.
2318.37 *5*				dσ/dΩ=2.3 μb/sr *4*.
2367.1 *5*				dσ/dΩ=0.2 μb/sr *3*.
2377.67 *18*				dσ/dΩ=1.8 μb/sr *3*.
2403.54[@] *6*	7/2$^-$	3	0.0169 *8*	dσ/dΩ=7.1 μb/sr *7*.
2462.75 *9*	3/2$^-$	1	0.00133 *11*	dσ/dΩ=3.7 μb/sr *4*.
2477.15 *12*	1/2$^-$	1	0.0093 *3*	dσ/dΩ=31 μb/sr *2*.
2500.69 *14*	3/2$^-$	1	0.0064 *2*	dσ/dΩ=17.9 μb/sr *14*.
2522.16[@] *9*	(3/2$^-$)	1,3		dσ/dΩ=2.0 μb/sr *3*.
2588.18 *16*	3/2$^-$	1	0.00057 *7*	dσ/dΩ=1.9 μb/sr *4*.
2600.58[@] *8*	3/2$^-$	1	0.00208 *12*	dσ/dΩ=7.7 μb/sr *8*.
2610.1 *2*	1/2$^-$,3/2$^-$	1		dσ/dΩ=1.9 μb/sr *5*.
2634.51[@] *5*	7/2$^-$	3	0.305 *7*	dσ/dΩ=90 μb/sr *7*.
2645.1 *6*				dσ/dΩ=4.6 μb/sr *10*.
2692.2 *6*	5/2$^-$	3	0.0197 *9*	dσ/dΩ=5.7 μb/sr *6*.
2749.77[@] *10*	7/2$^-$	3	0.087 *2*	dσ/dΩ=26 μb/sr *2*.
2769.3 *2*	5/2$^-$,7/2$^-$	3		dσ/dΩ=0.6 μb/sr *3*.
2781.3 *3*				dσ/dΩ=1.0 μb/sr *4*.
2837.5 *2*	7/2$^-$	3	0.0328 *12*	dσ/dΩ=9.7 μb/sr *9*.
2856.0 *3*				dσ/dΩ=6.0 μb/sr *7*.
2869.7 *5*		1,3		dσ/dΩ=1.1 μb/sr *4*.
2890.6 *5*	5/2$^-$,7/2$^-$,9/2$^+$	3,4		dσ/dΩ=1.1 μb/sr *3*.
2910.3 *4*				dσ/dΩ=3.5 μb/sr *5*.
2928.8 *5*	5/2$^-$	3	0.0103 *7*	dσ/dΩ=5.4 μb/sr *7*.
2957.2 *5*	3/2$^-$	1	0.00074 *7*	dσ/dΩ=2.2 μb/sr *4*.
2976.9 *7*	1/2$^-$	1	0.00062 *7*	dσ/dΩ=1.8 μb/sr *4*.
2993.9 *5*	3/2$^-$	1	0.00161 *10*	dσ/dΩ=4.1 μb/sr *6*.
3004.0 *5*	7/2$^-$	3	0.090 *2*	dσ/dΩ=29 μb/sr *2*.
3020.3 *6*	7/2$^-$	3	0.0044 *6*	dσ/dΩ=1.5 μb/sr *4*.
3047.6 *8*				dσ/dΩ=1.7 μb/sr *4*.
3061.7 *5*				dσ/dΩ=3.1 μb/sr *5*.
3079.8 *8*	5/2$^-$,7/2$^-$,9/2$^+$	3,4		dσ/dΩ=2.1 μb/sr *5*.
3088.2 *6*				dσ/dΩ=1.4 μb/sr *4*.
3108.0 *7*				dσ/dΩ=0.2 μb/sr *3*.
3121.1 *8*				dσ/dΩ=0.5 μb/sr *3*.
3136.1 *6*	3/2$^-$	1	0.00021 *5*	dσ/dΩ=0.5 μb/sr *3*.
3164.9 *10*				dσ/dΩ=4.9 μb/sr *6*.
3180.1 *17*	5/2$^-$	3	0.0022 *5*	dσ/dΩ=0.8 μb/sr *6*.
3191 *3*	3/2$^-$	1	0.00070 *7*	dσ/dΩ=1.7 μb/sr *4*.
3204.5 *11*		1,3		dσ/dΩ=2.2 μb/sr *4*.
3215.3 *8*	5/2$^-$,7/2$^-$	3		dσ/dΩ=1.7 μb/sr *4*.
3233.8 *15*		1,3		dσ/dΩ=0.4 μb/sr *3*.
3249.2 *11*	5/2$^-$,7/2$^-$	3		dσ/dΩ=1.1 μb/sr *10*.

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^{64}Zn(pol d,t) 2013Le19 (continued)

^{63}Zn Levels (continued)

E(level)[†]	Jπ[‡]	L[#]	C^{2}S[#]	Comments
3266.5 *12*	3/2$^-$	1	0.00039 *7*	dσ/dΩ=1.1 μb/sr *4*.
3292.5 *10*	7/2$^-$	3	0.0479 *15*	dσ/dΩ=16.8 μb/sr *14*.
3315.3 *13*	5/2$^-$	3	0.0032 *5*	dσ/dΩ=1.4 μb/sr *4*.
3340.4 *10*	3/2$^-$	1	0.0049 *2*	dσ/dΩ=15.8 μb/sr *17*.
3346.3 *9*	7/2$^-$	3	0.069 *3*	dσ/dΩ=27 μb/sr *2*.
3365.5 *10*	7/2$^-$	3	0.0324 *11*	dσ/dΩ=11.7 μb/sr *11*.
3384.9 *14*	7/2$^-$	3	0.0027 *4*	dσ/dΩ=1.1 μb/sr *3*.
3398.1 *12*	3/2$^-$	1	0.00100 *8*	dσ/dΩ=3.6 μb/sr *5*.
3441.8 *12*	5/2$^-$	3	0.0031 *4*	dσ/dΩ=1.1 μb/sr *3*.
3509.4 *11*	3/2$^-$	1	0.00316 *16*	dσ/dΩ=9.8 μb/sr *11*.
3516.5 *10*	9/2$^+$	4	0.0097 *13*	dσ/dΩ=2.5 μb/sr *7*.
3559 *3*				dσ/dΩ=0.5 μb/sr *3*.
3580.8 *14*				dσ/dΩ=0.8 μb/sr *3*.
3612.0 *12*	7/2$^-$	3	0.0121 *6*	dσ/dΩ=5.5 μb/sr *6*.
3634.9 *11*	5/2$^-$,7/2$^-$	3		dσ/dΩ=1.5 μb/sr *4*.
3647.7 *11*	3/2$^-$	1	0.00105 *8*	dσ/dΩ=2.7 μb/sr *5*.
3668.1 *7*				dσ/dΩ=0.3 μb/sr *3*.
3680.2 *10*	3/2$^-$	1	0.00209 *13*	dσ/dΩ=6.0 μb/sr *8*.
3688.5 *5*	7/2$^-$	3	0.0050 *6*	dσ/dΩ=2.0 μb/sr *6*.
3723.7 *15*				dσ/dΩ=0.6 μb/sr *3*.
3735.7 *11*				dσ/dΩ=2.0 μb/sr *3*.
3749.5 *9*	9/2$^+$	4	0.0305 *14*	dσ/dΩ=12.6 μb/sr *11*.
3756.5 *10*	5/2$^-$,7/2$^-$	3		dσ/dΩ=1.7 μb/sr *6*.
3767.5 *13*				dσ/dΩ=1.3 μb/sr *5*.
3781.7 *11*				dσ/dΩ=0.8 μb/sr *3*.
3799.1 *8*	9/2$^+$	4	0.0064 *4*	dσ/dΩ=2.6 μb/sr *3*.
3829 *9*				dσ/dΩ=0.7 μb/sr *4*.
3836 *4*	5/2$^-$,7/2$^-$	3		dσ/dΩ=1.0 μb/sr *4*.
3844 *4*				dσ/dΩ=0.4 μb/sr *5*.
3862 *2*				dσ/dΩ=0.3 μb/sr *2*.
3879.8 *5*	9/2$^+$	4	0.0298 *11*	dσ/dΩ=11.1 μb/sr *10*.
3889.2 *6*	7/2$^-$	3	0.0071 *4*	dσ/dΩ=3.4 μb/sr *5*.
3899.6 *10*	5/2$^-$,7/2$^-$	3		dσ/dΩ=0.8 μb/sr *3*.
3916.5 *15*				dσ/dΩ=1.2 μb/sr *4*.
3923.9 *8*				dσ/dΩ=6.3 μb/sr *7*.
3932.4 *19*				dσ/dΩ=1.4 μb/sr *3*.
3940.5 *15*	7/2$^-$	3	0.0015 *2*	dσ/dΩ=0.3 μb/sr *3*.
3976.8 *9*	9/2$^+$	4	0.0031 *4*	dσ/dΩ=1.4 μb/sr *3*.
3997 *2*				dσ/dΩ=1.0 μb/sr *3*.
4004 *2*				dσ/dΩ=0.6 μb/sr *3*.
4017.9 *13*	5/2$^-$	3	0.0015 *3*	dσ/dΩ=0.9 μb/sr *3*.
4026.0 *13*	3/2$^-$	1	0.00036 *5*	dσ/dΩ=0.8 μb/sr *3*.
4039 *4*	7/2$^-$	3	0.0009 *2*	dσ/dΩ=0.4 μb/sr *2*.
4057.6 *13*	7/2$^-$	3	0.0066 *5*	dσ/dΩ=2.8 μb/sr *4*.
4067 *5*				dσ/dΩ=0.4 μb/sr *7*.
4079.6 *15*				dσ/dΩ=0.7 μb/sr *6*.
4094.5 *14*	7/2$^-$	3	0.0035 *3*	dσ/dΩ=2.1 μb/sr *3*.
4111.6 *12*	3/2$^-$	1	0.00210 *10*	dσ/dΩ=4.4 μb/sr *5*.
4121.4 *13*	7/2$^-$	3	0.0125 *7*	dσ/dΩ=5.5 μb/sr *6*.
4130 *2*	7/2$^-$	3	0.0018 *4*	dσ/dΩ=0.5 μb/sr *3*.
4152.8 *15*	5/2$^-$	3	0.0019 *2*	dσ/dΩ=0.9 μb/sr *3*.
4167 *2*	5/2$^-$,7/2$^-$	3		dσ/dΩ=1.4 μb/sr *4*.
4174.2 *18*	5/2$^-$,7/2$^-$	3		dσ/dΩ=1.7 μb/sr *4*.
4184.1 *19*	7/2$^-$	3	0.0034 *4*	dσ/dΩ=2.1 μb/sr *4*.
4195 *4*	5/2$^-$,7/2$^-$,9/2$^+$	3,4		dσ/dΩ=0.6 μb/sr *3*.
4214.1[a] *16*	7/2$^-$	3	0.0128 *5*	dσ/dΩ=18.8 μb/sr *11*.

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^{64}Zn(pol d,t) 2013Le19 (continued)

^{63}Zn Levels (continued)

E(level)†	Jπ‡	L#	C^{2}S#	Comments
4230.1[a] *19*	3/2$^-$	1	0.00101 *7*	dσ/dΩ=2.6 μb/sr *4*.
4245.5[a] *19*	7/2$^-$	3	0.0020 *2*	dσ/dΩ=2.3 μb/sr *4*.
4260[a] *2*	9/2$^+$	4	0.0370 *17*	dσ/dΩ=23.5 μb/sr *14*.
4265[a] *3*	3/2$^-$	1	0.00144 *9*	dσ/dΩ=3.7 μb/sr *6*.
4286.5[a] *19*	5/2$^-$,7/2$^-$	3		dσ/dΩ=9.7 μb/sr *7*.
4312.1[a] *19*	7/2$^-$	3	0.0171 *6*	dσ/dΩ=23.5 μb/sr *14*.
4332[a] *2*	7/2$^-$	3	0.0206 *7*	dσ/dΩ=28.8 μb/sr *16*.
4396[a] *2*	5/2$^-$,7/2$^-$	3		dσ/dΩ=4.0 μb/sr *5*.
4405[b] *3*	1/2$^-$	1	0.00030 *5*	dσ/dΩ=0.9 μb/sr *8*.
4415[b] *3*	1/2$^-$	1	0.00043 *5*	dσ/dΩ=0.9 μb/sr *9*.
4427[b] *2*	1/2$^-$	1	0.00022 *4*	dσ/dΩ=0.6 μb/sr *3*.
4445[b] *2*	1/2$^-$	1	0.00037 *4*	dσ/dΩ=1.0 μb/sr *4*.
4455[b] *3*	5/2$^-$,7/2$^-$	3		dσ/dΩ=2.3 μb/sr *4*.
4471[b] *3*	3/2$^-$	1	0.00049 *5*	dσ/dΩ=1.3 μb/sr *3*.
4482[b] *3*	5/2$^-$,7/2$^-$	3		dσ/dΩ=3.9 μb/sr *5*.
4490[b] *3*	1/2$^-$	1	0.00063 *5*	dσ/dΩ=2.0 μb/sr *4*.
4505[b] *3*	1/2$^-$	1	0.00019 *5*	dσ/dΩ=0.6 μb/sr *4*.
4523[b] *3*	5/2$^-$,7/2$^-$	3		dσ/dΩ=1.2 μb/sr *3*.
4535 *3*	7/2$^-$	3	0.00110 *17*	dσ/dΩ=0.5 μb/sr *3*.
4546 *3*	5/2$^-$,7/2$^-$	3		dσ/dΩ=1.7 μb/sr *4*.
4558 *3*	5/2$^-$,7/2$^-$	3		dσ/dΩ=0.8 μb/sr *3*.
4569 *3*	5/2$^-$,7/2$^-$	3		dσ/dΩ=2.7 μb/sr *4*.
4585 *3*	3/2$^-$	1	0.00053 *5*	dσ/dΩ=1.0 μb/sr *3*.
4602 *3*	1/2$^-$	1	0.00027 *4*	dσ/dΩ=0.5 μb/sr *2*.
4619 *3*	5/2$^-$,7/2$^-$	3		dσ/dΩ=1.1 μb/sr *3*.
4630 *4*	5/2$^-$,7/2$^-$	3		dσ/dΩ=0.5 μb/sr *2*.
4638 *3*	1/2$^-$	1	0.00025 *4*	dσ/dΩ=0.7 μb/sr *3*.
4655 *4*	5/2$^-$,7/2$^-$	3		dσ/dΩ=1.4 μb/sr *3*.
4667 *4*				dσ/dΩ=0.3 μb/sr *3*.
4689 *3*	5/2$^-$	3	0.00081 *15*	dσ/dΩ=0.3 μb/sr *2*.
4699 *4*	1/2$^-$	1	0.00059 *5*	dσ/dΩ=1.3 μb/sr *4*.
4707 *4*	3/2$^-$	1	0.00080 *6*	dσ/dΩ=1.4 μb/sr *4*.
4720 *4*	1/2$^-$,3/2$^-$	1		dσ/dΩ=0.7 μb/sr *3*.
4732 *5*				dσ/dΩ=0.4 μb/sr *3*.
4745 *4*				dσ/dΩ=0.2 μb/sr *2*.
4764 *4*	5/2$^-$,7/2$^-$	3		dσ/dΩ=1.1 μb/sr *3*.
4777 *4*	7/2$^-$	3	0.0084 *4*	dσ/dΩ=4.2 μb/sr *5*.

† From 2013Le19. Some information is obtained by B. Singh as e-mail reply of June 13, 2013 from the first author K.G. Leach, as noted.

‡ From L-transfer deduced from $\sigma(\theta)$ distribution and vector analyzing powers (2013Le19). When no J^π assignment is given, no L or J^π information could be extracted form $\sigma(\theta)$ data.

From DWBA analysis of measured $\sigma(\theta)$ (2013Le19). For C^{2}S, statistical and 5% systematic uncertainties are summed in quadrature and systematic uncertainties due to model-dependent effects are not included.

@ Known level used for calibration purpose. Information obtained as e-mail reply of June 13, 2013 from K.G. Leach.

& Unresolved doublet. Two-component fit performed to extract C^{2}S.

[a] Measured at 20°.

[b] Measured at 25°.