$^{64}Zn(^{3}He,t)$ 2019Di08,1974Ro16

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 178, 41 (2021).	12-Nov-2021

2019Di08: 140 MeV/nucleon ^{3}He beam from the K=400 Ring Cyclotron at the Research Center for Nuclear Physics, Osaka. Tritons were detected with a focal-plane detector system and momentum analyzed using the Grand Raiden spectrometer. Target=98-99% enriched ^{64}Zn of 1.09 mg/cm^2 thickness. Measured excitation energies of Gamow-Teller transitions and angular distributions in five steps: 0.0° to 0.5°, 0.5° to 0.8°, 0.8° to 1.2°, 1.2° to 1.6° and 1.6° to 2.0°. FWHM=34 keV. Deduced Gamow-Teller strengths. DWBA calculations. Comparison with shell-model calculations, and with experimental data for $^{64}Zn(d,^{2}He)^{64}Cu$ in 2008Gr10.
1974Ro16: E(^{3}He)=37.6 MeV, FWHM=35 keV. Data at 9° and 12° (lab). Levels given up to 2548 keV.
Others:
1971Be29: E(^{3}He)=24.6 MeV. IAS identified at 2025. Deduced Coulomb-displacement energy.
1970Hi06: E(^{3}He)=35 MeV, FWHM=25 keV, $\sigma(\theta)$ (from 10° to 35°)(c.m.) for g.s. and 2050 level; DWBA analysis.
1970No05: analysis of $\sigma(\theta)$ for g.s.

^{64}Ga Levels

Counts given under comments correspond to raw number of events in the peaks in the 0°-cut of triton spectrum in 2019Di08.

E(level)[†]	J^{π}[#]	L[†]	B(GT) (2019Di08).[@]	Comments
0[‡]	0^+	0		E(level): listed in 1974Ro16 as 0 *4*. J^{π}: from the Adopted Levels, also $\sigma(\theta)$ (1970Hi06). L: From 1970Hi06. Shape of $\sigma(\theta)$ resembles L=1 better than L=0 but 1970No05 show that this result is to be expected. Antianalog state (1970Hi06,1970No05).
41[‡] *3*				
127.4[‡] *21*	1^+	0	0.034 *2*	E(level): 127 *5* (2019Di08). Counts=1291 *36*.
172[‡] *3*				
323.0[‡]				
425.2[‡] *17*	1^+	0	0.152 *7*	E(level): 426 *5* (2019Di08). Counts=5755 *76*.
545.2[‡] *20*		≥1		E(level): 547 *5* (2019Di08). Counts=154 *13*.
598.6[‡] *23*				
669.0[‡] *20*	1^+	0	0.084 *4*	E(level): 666 *5* (2019Di08). Counts=3199 *57*.
710[‡] *3*				
763[‡] *3*				
818.1[‡] *19*	(1^+)	(0)	0.033 *2*	E(level): 818 *5* (2019Di08). Counts=1263 *36*.
851[‡] *3*				
936.0[‡] *21*	1^+	0	0.046 *2*	E(level): 941 *5* (2019Di08). Counts=1752 *42*.
1016.9[‡] *19*				
1030 *5*		≥1		Counts=317 *18*.
1053[‡] *4*				
1065 *5*	(1^+)	(0)	≥0.01	Counts=96 *12*.
1134[‡] *6*				
1232.0[‡] *20*		≥1		E(level): 1235 *5* (2019Di08). Counts=127 *12*.

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$^{64}Zn(^{3}He,t)$ 2019Di08,1974Ro16 (continued)

^{64}Ga Levels (continued)

E(level)[†]	Jπ[#]	L[†]	B(GT) (2019Di08).[@]	Comments
1273.5[‡] *22*		≥1		E(level): 1268 *5* (2019Di08). Counts=66 *9*.
1359.5[‡] *21*		≥1		E(level): 1365 *5* (2019Di08). Counts=59 *9*.
1421[‡] *3*		≥1		E(level): 1430 *5* (2019Di08). Counts=893 *30*.
1460[‡] *3*				
1552[‡] *5*		≥1		E(level): 1540 *5* (2019Di08). Counts=68 *9*.
1578[‡] *6*				
1682.7[‡] *18*		≥1		E(level): 1685 *5* (2019Di08). Counts=574 *24*.
1759 *5*		≥1		Counts=246 *16*.
1785[‡] *4*				
1803 *5*	1^+	0	0.148 *7*	Counts=5560 *75*.
1818[‡] *4*				
1859.4[‡] *17*		≥1		E(level): 1864 *5* (2019Di08). Counts=5489 *74*.
1923 *5*	0^+	0		E(level): 1905.1 *23* (1974Ro16), 2025 *30* (1971Be29), 2050 (1970Hi06). σ(g.s.)/σ(2050)=0.09 (1970Hi06). L: from $\sigma(\theta)$ (2019Di08,1970Hi06). Jπ: $\sigma(\theta)$ and analog state of g.s. of ^{64}Zn (2019Di08,1970Hi06). Counts=16499 *129*.
1991 *5*		≥1		E(level): 2004 *4* (1974Ro16). Counts=261 *16*.
2056[‡] *3*				
2189 *5*		≥1		E(level): 2180.9 *17* (1974Ro16). Counts=1177 *35*.
2223 *5*		≥1		Counts=127 *12*.
2313 *5*		≥1		Counts=312 *18*.
2336.7[‡] *18*				
2356 *5*		≥1		Counts=53 *8*.
2384[‡] *4*				
2415[‡] *3*				
2448 *5*		≥1		E(level): 2446.2 *19* (1974Ro16). Counts=1901 *44*.
2547.6[‡] *17*				
2585 *5*	1^+	0	0.025 *1*	Counts=938 *31*.
2645 *5*	1^+	0	0.016 *1*	Counts=599 *25*.
2730 *5*		≥1		Counts=1433 *38*.
2874 *5*		≥1		Counts=169 *14*.
2913 *5*	1^+	0	0.026 *1*	Counts=957 *32*.
2994 *5*		≥1		Counts=268 *18*.
3084 *5*	1^+	0	0.011 *1*	Counts=409 *20*.
3168 *5*		≥1		Counts=62 *8*.
3222 *5*	1^+	0	0.219 *10*	Counts=8120 *90*.
3289 *5*	1^+	0	0.082 *4*	Counts=3031 *55*.
3332 *5*	1^+	0	0.060 *3*	Counts=2228 *47*.
3430 *5*		≥1		Counts=1405 *38*.
3527 *5*	1^+	0	0.086 *4*	Counts=3165 *56*.
3586 *5*		≥1		Counts=601 *25*.
3690 *5*		≥1		Counts=351 *19*.
3764 *5*		≥1		Counts=930 *35*.

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$^{64}Zn(^{3}He,t)$ 2019Di08,1974Ro16 (continued)

^{64}Ga Levels (continued)

E(level)†	Jπ#	L†	B(GT) (2019Di08).@	Comments
3829 *5*	1+	0	0.041 *2*	Counts=1513 *40*.
3911 *5*	1+	0	0.021 *1*	Counts=784 *28*.
3954 *5*		≥1		Counts=668 *26*.
4033 *5*	(1+)	(0)	0.028 *2*	Counts=1011 *32*.
4086 *5*	1+	0	0.064 *3*	Counts=2338 *49*.
4121 *5*	1+	0	0.013 *1*	Counts=462 *22*.
4197 *5*		≥1		Counts=684 *27*.
4323 *5*		≥1		Counts=404 *21*.
4437 *5*		≥1		Counts=712 *29*.
4679 *5*	1+	0	0.071 *3*	Counts=2570 *51*.
4721 *5*	1+	0	0.048 *2*	Counts=1742 *42*.
4937 *5*	(1+)	(0)	0.037 *2*	Counts=1343 *37*.
5004 *5*	1+	0	0.019 *1*	Counts=688 *27*.
5134 *5*	1+	0	0.023 *1*	Counts=831 *29*.
5272 *5*	1+	0	0.019 *1*	Counts=681 *27*.
5322 *5*	1+	0	0.031 *2*	Counts=1108 *34*.
5349 *5*		≥1		Counts=433 *23*.
5503 *5*		≥1		Counts=1512 *41*.
5578 *5*	1+	0	0.045 *2*	Counts=1602 *40*.
5643 *5*		≥1		Counts=282 *26*.
5746 *5*		≥1		Counts=1824 *43*.
5853 *5*	(1+)	(0)	0.030 *2*	Counts=1071 *33*.
6131 *5*		≥1		Counts=620 *25*.
6171 *5*		≥1		Counts=897 *30*.
6247 *5*	1+	0	0.019 *1*	Counts=674 *27*.
6285 *5*	1+	0	0.024 *1*	Counts=868 *30*.
6359 *5*	1+	0	0.071 *3*	Counts=2534 *51*.
6412 *5*	1+	0	0.039 *2*	Counts=1389 *38*.
6562 *5*	1+	0	0.035 *2*	Counts=1256 *36*.
6608 *5*	1+	0	0.023 *1*	Counts=830 *29*.
6682 *5*	1+	0	0.071 *3*	Counts=2516 *51*.
6733 *5*	1+	0	0.036 *2*	Counts=1273 *36*.
6774 *5*	1+	0	0.028 *2*	Counts=984 *32*.
6850 *5*	1+	0	0.055 *3*	Counts=1939 *44*.
6884 *5*	1+	0	0.057 *3*	Counts=2009 *45*.
6971 *5*	1+	0	0.026 *1*	Counts=920 *31*.
7065 *5*	1+	0	0.022 *1*	Counts=767 *28*.
7173 *5*	1+	0	0.024 *1*	Counts=834 *29*.
7301 *5*	1+	0	0.033 *2*	Counts=1148 *34*.
7335 *5*		≥1		Counts=1085 *33*.
7389 *5*	1+	0	0.027 *1*	Counts=931 *31*.
7416 *5*	1+	0	0.022 *1*	Counts=755 *28*.
7450 *5*	1+	0	0.018 *1*	Counts=629 *25*.
7511 *5*	1+	0	0.073 *4*	Counts=2532 *51*.
7578 *5*		≥1		Counts=601 *25*.
7619 *5*	1+	0	0.021 *1*	Counts=724 *27*.
7679 *5*	1+	0	0.029 *2*	Counts=1020 *32*.
7713 *5*		≥1		Counts=461 *22*.
7740 *5*		≥1		Counts=288 *17*.
7760 *5*		≥1		Counts=660 *26*.
7787 *5*		≥1		Counts=409 *20*.
7841 *5*	(1+)	(0)	0.018 *1*	Counts=612 *25*.
7888 *5*		≥1		Counts=420 *21*.
7942 *5*	1+	0	0.040 *2*	Counts=1377 *38*.
7996 *5*		≥1		Counts=517 *23*.
8037 *5*	(1+)	(0)	0.016 *1*	Counts=541 *24*.

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^{64}Zn(^{3}He,t) 2019Di08,1974Ro16 (continued)

^{64}Ga Levels (continued)

E(level)†	Jπ#	L†	B(GT) (2019Di08).@	Comments
8070 *5*	1+	0	0.023 *1*	Counts=792 *29*.
8151 *5*	1+	0	0.055 *3*	Counts=1883 *44*.
8300 *5*		≥1		Counts=694 *27*.
8496 *5*	(1+)	(0)	0.013 *1*	Counts=437 *22*.
8577 *5*	1+	0	0.036 *2*	Counts=1229 *35*.
8665 *5*		≥1		Counts=647 *26*.
8838 *5*	1+	0	0.023 *1*	Counts=766 *28*.
8902 *5*	1+	0	0.015 *1*	Counts=502 *24*.
9010 *5*	(1+)	(0)	0.023 *1*	Counts=793 *28*.
9058 *5*		≥1		Counts=460 *22*.
9112 *5*	1+	0	0.023 *1*	Counts=766 *28*.
9146 *5*		≥1		Counts=446 *21*.
9207 *5*		≥1		Counts=253 *16*.
9254 *5*		≥1		Counts=370 *20*.
9376 *5*		≥1		Counts=306 *18*.
9437 *5*		≥1		Counts=537 *23*.
9471 *5*		≥1		Counts=260 *16*.
9586 *5*	(1+)	(0)	0.016 *1*	Counts=536 *23*.
9641 *5*	(1+)	(0)	0.016 *1*	Counts=540 *23*.
9695 *5*	1+	0	0.030 *2*	Counts=989 *32*.
9851 *5*	1+	0	0.021 *1*	Counts=707 *27*.
9973 *5*	(1+)	(0)	0.020 *1*	Counts=671 *26*.
10055 *5*		≥1		Counts=352 *19*.
10095 *5*	1+	0	0.054 *3*	Counts=1798 *43*.
10163 *5*		≥1		Counts=192 *14*.
10442 *10*	(1+)	(0)	0.083 *4*	Counts=2737 *53*.
10544 *10*	(1+)	(0)	0.013 *1*	Counts=428 *21*.
10639 *10*	(1+)	(0)	0.085 *4*	Counts=2789 *53*.
13990	(1+)			E(level): From Fig. 7a in 2019Di08, interpreted by authors as isospin T=3 analog state of 2660, 1+ level in ^{64}Cu.
14080				E(level): from Fig. 7a in 2019Di08.
14510	(1+)			E(level): from Fig. 7a in 2019Di08, interpreted by authors as isospin T=3 analog state of 3190, 1+ level in ^{64}Cu.

† From 2019Di08 unless otherwise stated. Spectrum in 2019Di08 above 6 MeV is complex. Only the strong peaks between 6 and 10.7 MeV have been listed by the authors in their Tables III and IV. Above 10.7 MeV, only three discrete peaks are listed in the 14-14.5 MeV region.

‡ From 1974Ro16.

L=0 implies J=0 or 1, however 1+ is assigned for most of the levels as these are interpreted by 2019Di08 as Gamow-Teller transitions. Further, the authors suggest isospin T=1 states below 10 MeV excitation, with the isospin T=2 states around 12 MeV and isospin T=3 states around 15 MeV.

@ Summed experimental B(GT)=2.89 *2* up to 10.7 MeV, compared to 6.05 from shell-model cumulative sums. Up to ≈7 MeV excitation, summed experimental B(GT) agrees well with shell-model prediction.