^{96}Zr(t,p),(t,pγ) 1974Fl02,1986Me11

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen, Balraj Singh	NDS 164, 1 (2020)	15-Feb-2020

1974Fl02 (also 1969Bl01,1968BeZS): E=20 MeV proton beam was produced from the Los Alamos three-stage Van de Graaff. Target was rolled metallic foil of 500 μg/cm^2 thick isotopically enriched ^{96}Zr. Reaction products were detected with a silicon ΔE-E telescope (FWHM=40 keV) and also with a magnetic spectrograph (FWHM=18 keV) at several angles. Measured σ(θ) (12° to 72°). Deduced levels, J, π, L-transfers from analysis with the Distorted-wave calculations. Cross section data are available at 39° (1974Fl02) and 37° (1969Bl01).

1986Me11 (also 1986HeZT): measured Eγ, Iγ, γγ-coin, E(ce), pγγ(t) with the Lawrence Livermore National Laboratory in-beam spectroscopy system at the Los Alamos Ion Beam facility. Deduced levels. IBA model calculations. Details of γ-ray measurements are not available.

Theoretical calculations: 1983Os02, 1977Os09, 1977Os03, 1973Os04, 1972Os05.

^{98}Zr Levels

E(level)[†]	Jπ[#]	L[@]	σ at 37° (mb/sr)[&]	Comments
0	0$^+$	0	0.219	σ(exp)/σ(DW)=2.8 (1974Fl02) for configuration=$\nu s_{1/2}\otimes\nu s_{1/2}$.
854[‡a] *1*	0$^+$			
1222[‡] *1*	2$^+$	2	0.041	σ(exp)/σ(DW)=0.84 (1974Fl02) for configuration=$\nu d_{3/2}\otimes\nu d_{3/2}$. B(E2)(to 854)/B(E2)(to g.s.)=11 (1986Me11).
1437[‡] *1*	0$^+$			
1590[a] *1*	2$^+$	2	0.033	σ(exp)/σ(DW)=1.3 (1974Fl02) for configuration=$\nu d_{3/2}\otimes\nu g_{7/2}$. B(E2)(to 1437)/B(E2)(to 854)>2 (1986Me11).
1744[‡] *1*	2$^+$	2	0.137	σ(exp))/σ(DW)=0.94 (1974Fl02) for configuration=$\nu s_{1/2}\otimes\nu d_{3/2}$. B(E2)(to 854)/B(E2)(to g.s.)=5 (1986Me11).
1806[‡] *1*		3	0.102	σ(exp))/σ(DW)=84 (1974Fl02) for configuration=$\nu h_{11/2}\otimes\nu g_{7/2}$.
1843[‡a] *1*	4$^+$		0.020	1986Me11 suggest 4$^+$ from B(E2)(to 1224)/B(E2)(to 1591)<2. γγ(θ) data (1988StZS,1994St31) give J=3, instead.
1859[‡] *1*	0$^+$			
2048[‡] *1*	4$^+$	4	0.134	σ(exp))/σ(DW)=1.0 (1974Fl02) for configuration=$\nu s_{1/2}\otimes\nu g_{7/2}$. B(E2)(to 1591)/B(E2)(to 1224)=17 (1986Me11).
2104[‡] *1*				
2487[‡] *1*				
2491[‡a] *1*	6$^+$			Jπ: 6$^+$ suggested by 1986Me11.
2568[‡] *1*				
2613[‡] *1*				B(E2)(to 854)/B(E2)(to g.s.)=5 (1986Me11).
2800[‡] *1*		5	0.132	σ(exp))/σ(DW)=1.3 (1974Fl02) for configuration=$\nu d_{3/2}\otimes\nu h_{11/2}$.
3035 *8*			0.041	E(level): 3035, 3063, 3160 are unresolved (1974Fl02).
3063 *8*			0.069	
3160 *8*			0.023	
3205[‡a] *1*	8$^+$			
3271 *8*		4	0.026	
3354 *8*		5	0.071	L: from figure 8 in 1974Fl02 but in table 1974Fl02 quote $J^\pi=4^+$.
3435 *8*		2	0.022	L: from figure 8 in 1974Fl02 but in table 1974Fl02 quote $J^\pi=5^-$.
3506 *8*			0.024	E(level): 3506 and 3539 are unresolved (1974Fl02).
3539 *8*			0.036	
3739 *8*			0.024	E(level): 3739 and 3763 are unresolved (1974Fl02).
3763 *8*			0.012	
3825 *8*			0.018	E(level): 3825 and 3855 are unresolved (1974Fl02).
3855 *8*			0.015	
3886 *8*		(7)	0.021	
4005 *8*		(5,6)	0.107	
4061 *8*		(6)	0.054	

Continued on next page (footnotes at end of table)

^{96}Zr(t,p),(t,pγ) 1974Fl02,1986Me11 (continued)

^{98}Zr Levels (continued)

E(level)[†]	L[@]	σ at 37° (mb/sr)[&]	Comments
4097 *8*	(5,6)	0.022	
4225 *8*	6	0.024	
4365 *8*		0.040	E(level): 4365 and 4387 are unresolved (1974Fl02).
4387 *8*		0.030	
4450 *8*	(7)	0.038	
4608 *8*		0.046	

† From 1974Fl02, unless otherwise stated. Uncertainty of 8 keV assigned as for other nuclides in the paper by 1974Fl02.
‡ From (t,pγ) (1986Me11,1986HeZT). Uncertainty of 1 keV assigned by the evaluators.
# From the Adopted Levels.
@ From comparison of σ(θ) data with distorted-wave calculation (1974Fl02).
& From 1969Bl01. σ values at 39° are also available (1974Fl02).
a Band(A): Intruder band based on 854, 0^+. Band proposed by 1986Me11.

γ(^{98}Zr)

E_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]
422	1859	0^+	1437	0^+	E0
583	1437	0^+	854	0^+	E0
854	854	0^+	0	0^+	E0

† From 1986Me11. Only the E0 transitions are reported in this work.
‡ Inferred from ce data.

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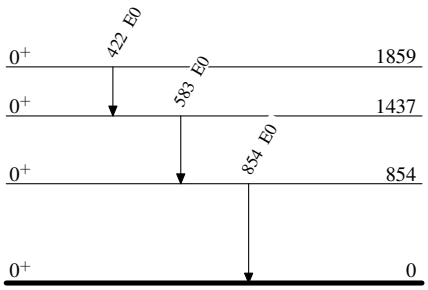
Level Scheme



$^{98}_{40}Zr_{58}$

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Band(A): Intruder band based on 854, 0^+

8^+ 3205

6^+ 2491

4^+ 1843

2^+ 1590

0^+ 854

$^{98}_{40}Zr_{58}$