^{90}Zr(α,^{3}He) 1970Bi03,2013Sh02

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Coral M. Baglin	NDS 114, 1293 (2013)	1-Sep-2013

Others: 2012ShZZ, 1996Be16, 1995Fo19, 1988Ga32 (E=183 MeV).

2013Sh02: E(α)=50 MeV from Yale WNSL tandem accelerator; >98% ^{90}Zr self-supporting target; Enge split-pole spectrometer with position-sensitive gas-filled ionization chamber at focal plane and plastic scin behind it; measured E(^{3}He) (FWHM ≈ 80 keV), $\sigma(\theta)$ (5°, 10°); deduced E(level), L-transfer, spectroscopic factors (C^2S); DWBA analysis. See 2012ShZZ for additional details of results from this experiment.

2012ShZZ: Submission to XUNDL database by authors of 2013Sh02,

1995Fo19 (see also 1996Be16 which includes many of the same authors): E=120 MeV; 97.6% ^{90}Zr target, magnetic spectrograph.

1970Bi03: E=65.9 MeV. 98.6% ^{90}Zr target. Broad-range spectrograph with photographic plates, FWHM=55 keV. θ(lab)=15° and 20°.

Centroids of single-particle strength are At E=3018 *28* and 2189 *2* for L=4 and 5, respectively (2013Sh02); however, some some L=5 strength remains unobserved.

Cross sections (dσ/dΩ mb/sr) (2012ShZZ).
Uncertainties quoted for cross sections are purely statistical.
There exists an additional systematic uncertainty of ≈7%.
Some of these data were reported by 2013Sh02 also.

Level	5°	10°
0	1.371 *21*	0.568 *15*
1877 *5*	0.342 *13*	0.175 *10*
2048 *1*	0.300 *16*	0.222 *11*
2171 *2*	4.653 *97*	2.514 *41*
2203 *2*	1.32 *10*	1.004 *35*
2333 *5*	0.549 *16*	0.432 *14*
2690 *3*	0.042 *9*	
2813 *2*	0.099 *11*	0.047 *5*
2875 *1*	0.052 *9*	0.028 *4*
3087 *1*	0.096 *9*	0.054 *5*
3291 *1*		0.026 *6*
3475 *1*		0.407 *30*
3558 *3*		0.100 *31*
3631 *3*		0.030 *8*
3917 *3*		0.252 *11*
4018 *11*		0.042 *11*

---

^{91}Zr Levels

E(level)[†]	L[‡]	S[#]	Comments
0		0.98	S: if $J^\pi=5/2^+$.
1874	4	0.087	S: if $J^\pi=7/2^+$. other E: 1877 (2013Sh02).
2040		0.45	S: if $J^\pi=3/2^+$. other E: 2048 (2013Sh02).
2176[@]	5		S=0.41 for $11/2^-$ component if S=0.48 is assumed for the $7/2^+$ component (as determined by 1970Bi02 in their (d,p) study). other E: 2171 (2013Sh02).
2203	4		E(level): reported only by 2013Sh02 and 2012ShZZ.
2323	5	0.053	S: if $J^\pi=11/2^-$. other E: 2333 (2013Sh02). presumed to be the known 2321 level.

Continued on next page (footnotes at end of table)

^{90}Zr(α,^{3}He) 1970Bi03,2013Sh02 (continued)

^{91}Zr Levels (continued)

E(level)[†]	L[‡]	S[#]	Comments
2690			E(level): from 2013Sh02, 2012ShZZ only.
2813			E(level): from 2013Sh02, 2012ShZZ only.
2847		0.13	S: if $J^\pi=3/2^+$.
2875			E(level): from 2013Sh02, 2012ShZZ only.
3063		0.22	S: if $J^\pi=3/2^+$. other E: 3087 (2013Sh02).
3277		0.19	S: if $J^\pi=3/2^+$. other E: 3291 (2013Sh02).
3466	4	0.34	S: if $J^\pi=7/2^+$. other E: 3475 (2013Sh02).
3558	4	0.08	S: if $J^\pi=7/2^+$. E(level): from 2013Sh02. other E: 3575 (1970Bi03).
3631			E(level): from 2013Sh02, 2012ShZZ only.
3676[@]			S=0.028 for $11/2^-$ component if S=0.11 is assumed for the $3/2^+$ component (as determined by 1970Bi02 in their (d,p) study).
3817		0.19	S: if $J^\pi=3/2^+$.
3904[@]	4		S=0.085 for $11/2^-$ component if S=0.045 is assumed for the $3/2^+$ component (as determined by 1970Bi02 in their (d,p) study). other E: 3917 (2013Sh02).
4018 *11*	4		E(level): from 2013Sh02, 2012ShZZ only. Presumed to be the known 4007 level.
4081		0.035	S: if $J^\pi=11/2^-$.
4254		0.056	S: if $J^\pi=11/2^-$.
$\approx 13\times10^3$[&]			

[†] From 1970Bi03, except as noted. In the spectrum in fig. 3, 1970Bi03 indicate additional levels at 4860 and 5120. Energies from 2012ShZZ are shown here In the table of cross sections. However, 2013Sh02 also report an estimated uncertainty of ≈5 keV. The evaluator suspects that the uncertainties reported by 2012ShZZ are statistical only, and the ≈5 keV stated in 2013Sh02 is the systematic uncertainty. adopted energies based on Eγ data differ by 4 to 6 keV from those of 2013Sh02.

[‡] Values from 2013Sh02 are based on combined analysis of (d,p) and (α,^{3}He) data, and deduced L values are shown In (d,p) dataset only.

[#] From DWBA (1970Bi03), assuming J^π value indicated in comments; in some cases, this J^π value differs from the adopted one.

[@] Unresolved doublet (1970Bi03).

[&] Centroid of very broad structure arising predominantly from excitation of the $i_{13/2}$ single-particle orbital (1988Ga32,1995Fo19). For its decay by n emission to states in ^{90}Zr, see 1995Fo19. 1995Fo19 also observe a 2170γ (^{91}Zr, 2170 to g.s.) in coincidence with ^{3}He populating this structure. This structure has not been included in Adopted Levels.