

⁸⁹Y(p,γ) **1969Ir01,1979Sz06**

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	S. K. Basu, E. A. Mccutchan	NDS 165,1 (2020)	1-Mar-2020

1967BI07: E=2.8-10 MeV. Measured $\sigma(E)$, $W(\theta)$, scin.
 1969Ir01: E=3930 keV. Measured $\sigma(E\gamma)$, semi.
 1973Ha62: E=5.4-17.0 MeV. Measured $\sigma(E,E\gamma,\theta)$, scin.
 1974Ra04: E=4.82 MeV. Measured $E\gamma$, $I\gamma$, semi.
 1979Sz06: E=2.2-3.4 MeV. Measured $E\gamma$, $I\gamma$, semi. Deduced gamma-ray strength function.
 1987Sz02: E=3.7-11.5 MeV. Measured $\sigma(E,E\gamma)$, semi. Deduced spectroscopic factors.
 1993Sa38: E=4 MeV. Measured $E\gamma$, $I\gamma$, $\gamma(\theta)$, levels half-life. Doppler-shift attenuation, Detector: NaI.
 2013Ha03: E=2,3,4 and 4.8 MeV; $4\pi\gamma$ summing technique using NaI(Tl) detector; measured $E\gamma$, $I\gamma$, $I\gamma(\theta)$, angle integrated cross-section; deduced astrophysical S-factor and reaction rates; statistical model calculations; TALYS code.
 2015Ne07: E=3.65 to 4.70 MeV. Measured $\sigma(E)$, $E\gamma$, $I\gamma$.
 The analog states are superimposed on the broad giant dipole resonance centered at $E(\text{level})\approx 16500$ with a width $\Gamma\approx 4000$ (1973Ha62).
 Other: 2014Ne18.

⁹⁰Zr Levels

E(level) [†]	J ^{πe}	T _{1/2} [‡]	C ² S ^d	Comments
0	0 ⁺			
1762 ^b 3	0 ⁺		0.80	
2187 ^b 3	2 ⁺	82 fs +16-12		
2320 ^{&b}	5 ⁻		1.16	
2740 ^{&}	(4) ⁻		0.97	
2748 3	3 ⁻			
3081 3	4 ⁺			
3308 3	2 ⁺	96 fs +6-5		
3842 3	2 ⁺	14 fs +6-4		
4126 3	0 ⁺			
4233 3				
4424 3	0 ⁺			
4581 3	1 ⁺	8.7 fs +13-9		
4681 3	2 ⁺			
4992 3				
5095 3				
5108 3	3 ⁻			
5187 3	0 ⁺ ,1 ⁺ ,2 ⁺			
5275.2 ^a	(2 ⁺)	0.8 ps +2-1		
5308 3				
6640.1 ^a	(2 ⁺)	21 fs +7-6		
7649.6 ^a	(2 ⁺)	0.55 ps +9-7		
11936 ^c 26				
12220 3				
12482 ^c 28				
12779 ^c 29				
12977 ^c 26				
13110 [@]				E(level): Probable analog of ⁹⁰ Y g.s. E(p)(lab)=4810.
13310 [@]				E(level): Probable analog of ⁹⁰ Y(203). E(p)(lab)=5010.
14430 [#]				E(level): Probable analog of ⁹⁰ Y(1371). E(p)(lab)=6140.
15500 [#]				E(level): E(p)(lab)=7220.
15700 [#]				E(level): E(p)(lab)=7420.

Continued on next page (footnotes at end of table)

⁸⁹Y(p,γ) **1969Ir01,1979Sz06 (continued)**

⁹⁰Zr Levels (continued)

E(level) [†]	Comments
15900 [#]	E(level): E(p)(lab)=7620.
16290 [#]	E(level): Probable analog of ⁹⁰ Y(3145). E(p)(lab)=8020.
17300 [#]	E(level): E(p)(lab)=9000.
19400 [#]	E(level): Possible analog resonance. E(p)(lab)=11100.
20800 [#]	E(level): Possible analog resonance. E(p)(lab)=12550.

[†] From 1979Sz06, except as noted.

[‡] From Doppler-shift attenuation method (1993Sa38).

[#] From 1973Ha62. For resonance parameters, see 1973Ha62. Calculated from E(p) by evaluators using S(p)=8353.1 keV *I6* (2017Wa10).

[@] From 1967B107. Calculated from E(p) by evaluators using S(p)=8353.1 keV *I6* (2017Wa10).

[&] From 1987Sz02.

^a From 1993Sa38.

^b 2013Ha03 confirmed population of this level from sum peaks and entry state at 11.317 MeV.

^c From 2015Ne07.

^d From comparison with statistical+direct–semidirect model, C²S=1.31 for g.s. was used to determine the strength of the optical potential (1987Sz02).

^e From the Adopted Levels.

γ(⁹⁰Zr)

E _i (level)	J _i ^π	E _γ	I _γ [@]	E _f	J _f ^π	Mult.	Comments
4581	1 ⁺	4582.7 [#]		0	0 ⁺	(E2) [#]	Mult.: Assigned (E2) multi-polarity is not consistent with J ^π =1 ⁺ , as adopted for 4581 level.
5275.2	(2 ⁺)	5275.2 [#]		0	0 ⁺	(E2) [#]	
6640.1	(2 ⁺)	6640.1 [#]		0	0 ⁺	(E2) [#]	
7649.6	(2 ⁺)	7649.6 [#]		0	0 ⁺	(E2) [#]	
12220		8383 ^{† 6}	18	3842	2 ⁺		
		8919 ^{† 6}	26	3308	2 ⁺		
		9467 ^{† 6}	16	2748	3 ⁻		
		10033 ^{† 6}	47	2187	2 ⁺		
		10453 ^{† 6}	40	1762	0 ⁺		
		12212 ^{† 6}	100	0	0 ⁺		
13110		9270 [‡]		3842	2 ⁺		
		9800 [‡]		3308	2 ⁺		
		10360 [‡]		2748	3 ⁻		
		10920 [‡]		2187	2 ⁺		
		11350 [‡]		1762	0 ⁺		
		13110 [‡]		0	0 ⁺		

[†] From 1969Ir01.

[‡] Approximate E_γ from level energy difference. Observed by 1974Ra04.

[#] From 1993Sa38.

[@] From 1969Ir01.

${}^{89}\text{Y}(p,\gamma)$ 1969Ir01,1979Sz06

Level Scheme

Intensities: % photon branching from each level

