

Coulomb excitation 1970AgZV,1968An12,1965Ro09

Type	History		Literature Cutoff Date
	Author	Citation	
Full Evaluation	Balraj Singh	ENSDF	30-Sep-2020

Others: 1970Ga20, 1970RoZS, 1965Al23, 1964Al28, 1963Ly01, 1962Gu04, 1962Ro03, 1961Ho05.

1970AgZV: ($\alpha, \alpha'\gamma$), E=5.0 MeV. They quote their B(E2) values relative to B(E2)(2⁺ in ⁷⁸Se)=0.385 compared to the recommended value 0.335 (1987Ra01).

1968An12: (¹²C, ¹²C' γ), E=33.6 MeV.

1965Ro09: ($\alpha, \alpha'\gamma$), E=6-9 MeV.

Other reactions:

(α, α'): 1963Ly01, E=2.6-3.5 MeV; 1962Ro03, E=2.1-8.0 MeV.

(¹⁴N, ¹⁴N'): 1965Al23, 1964Al28; 1962Gu04, E=16.5 MeV.

g-factor measurement: IMPAC technique (1970RoZS).

Pulsed beam technique for T_{1/2} measurements: 1963Ly01.

⁷⁷Se Levels

E(level)	J ^{π} [†]	T _{1/2}	Comments
0.0	1/2 ⁻		
161.7 24	7/2 ⁺	17.36 s 5	T _{1/2} : from the Adopted Levels. E(level): not directly excited in Coulomb excitation. Populated indirectly through 87 γ from 250 level (1962Ro03).
239.2 4	3/2 ⁻	25 ps 9	B(E2) \uparrow =0.180 10 B(E2) \uparrow : weighted average of 0.186 20 (1970AgZV), 0.13 3 (1968An12), 0.177 16 (1965Ro09). T _{1/2} : from B(E2) in Coulomb excitation. 1963Ly01 give 48 ps 35 (pulsed beam method).
250.0 5	5/2 ⁻	9.56 ns 10	B(E2) \uparrow =0.0111 12 B(E2) \uparrow : weighted average of 0.0106 20 (1970AgZV), 0.0094 26 (1965Ro09), 0.0125 20 (1963Ly01). Other: 0.0043 15 (1968An12). T _{1/2} : from $\gamma\gamma(t)$ in ⁷⁷ Br ϵ decay. From B(E2)=0.0111 12 and branching=0.653 7 one gets T _{1/2} =10.3 ns 11. From pulsed beam technique, 1963Ly01 obtained 9.1 ns 8.
439.8 4	5/2 ⁻	23.0 ps 13	B(E2) \uparrow =0.243 13 J ^{π} : $\Delta J=2$ from 440 $\gamma(\theta)$. B(E2) \uparrow : weighted average of 0.228 20 (1970AgZV), 0.21 4 (1968An12), 0.259 17 (1962Ro03). T _{1/2} : from B(E2). g-factor=0.41 11 (1970RoZS).
521.2 6	3/2 ⁻		B(E2) \uparrow =0.010 2 B(E2) \uparrow : from 1962Ro03. 1968An12 give 0.027 7. T _{1/2} : from B(E2), T _{1/2} =7 ps +7-5. This is quite discrepant from the value obtained in (γ, γ'). The discrepancy could be due to error in B(E2) or in the Γ factor in (γ, γ').
999.6? 9			B(E2) \uparrow =0.007 3 (1970Ga20) E(level): reported by 1970Ga20 only.

[†] From Adopted Levels.

$\gamma(^{77}\text{Se})$

E _{γ} [†]	I _{γ} [‡]	E _i (level)	J _i ^{π}	E _f	J _f ^{π}	Mult. [#]	δ	α [@]	Comments
87 4	1.6 2	250.0	5/2 ⁻	161.7	7/2 ⁺	E1		0.120 19	$\alpha(K)=0.107 17$; $\alpha(L)=0.0113 18$; $\alpha(M)=0.0017 3$; $\alpha(N)=0.000144 22$
161 3	1.2 2	161.7	7/2 ⁺	0.0	1/2 ⁻	E3		0.90 8	E _{γ} : γ seen by 1962Ro03 only. $\alpha(K)=0.75 7$; $\alpha(L)=0.129 13$; $\alpha(M)=0.0200 20$; $\alpha(N)=0.00145 14$
200.6 5	15 2	439.8	5/2 ⁻	239.2	3/2 ⁻	M1+E2	+0.09 3	0.0164 4	$\alpha(K)=0.0146 4$; $\alpha(L)=0.00157 4$; $\alpha(M)=0.000245 6$; $\alpha(N)=2.08 \times 10^{-5} 5$

Continued on next page (footnotes at end of table)

Coulomb excitation 1970AgZV,1968An12,1965Ro09 (continued) $\gamma(^{77}\text{Se})$ (continued)

E_γ †	I_γ ‡	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult. #	δ	α @	Comments
239.3 5	100 6	239.2	3/2 ⁻	0.0	1/2 ⁻	M1+E2	+0.18 3	0.0110 3	$A_2 = -0.145$ 34 (1962Ro03) δ : from Adopted Gammas. $\alpha(\text{K})=0.0097$ 3; $\alpha(\text{L})=0.00105$ 3; $\alpha(\text{M})=0.000163$ 5; $\alpha(\text{N})=1.38 \times 10^{-5}$ 4
250.1 5		250.0	5/2 ⁻	0.0	1/2 ⁻	E2		0.0283 5	$A_2 = -0.085$ 28 (1962Ro03) δ : from 239 $\gamma(\theta)$ (1962Ro03). $\alpha(\text{K})=0.0250$ 4; $\alpha(\text{L})=0.00284$ 5; $\alpha(\text{M})=0.000441$ 7; $\alpha(\text{N})=3.61 \times 10^{-5}$ 6
271		521.2	3/2 ⁻	250.0	5/2 ⁻				E_γ : from 1968An12.
282	0.12	521.2	3/2 ⁻	239.2	3/2 ⁻				E_γ : from 1968An12.
439.8 4	21.4 16	439.8	5/2 ⁻	0.0	1/2 ⁻	E2		0.00412 6	$\alpha(\text{K})=0.00366$ 6; $\alpha(\text{L})=0.000397$ 6; $\alpha(\text{M})=6.17 \times 10^{-5}$ 9; $\alpha(\text{N})=5.17 \times 10^{-6}$ 8 $A_2 = +0.482$ 48; $A_4 = -0.440$ 44 (1970RoZS); $A_2 = +0.265$ 22 (1962Ro03) $\gamma(\theta, \text{pol})$ measurement: 1965Al23.
478		999.6?		521.2	3/2 ⁻				
520.8	0.8 3	521.2	3/2 ⁻	0.0	1/2 ⁻	M1			E_γ : from 1968An12.
750		999.6?		250.0	5/2 ⁻				

† From 1965Ro09, unless otherwise specified.

‡ From 1962Ro03 for $E(\alpha)=5.04$ MeV.

From ce data in $^{76}\text{Se}(n, \gamma)$.

@ Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ -ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

Coulomb excitation 1970AgZV,1968An12,1965Ro09Level SchemeIntensities: Relative I_γ

Legend

- $I_\gamma < 2\% \times I_\gamma^{\max}$
- $I_\gamma < 10\% \times I_\gamma^{\max}$
- $I_\gamma > 10\% \times I_\gamma^{\max}$

