

⁶⁷Zn(p,n γ) 1977Pa08,1974Ca14,1971Mi21

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Huo Junde, Huang Xiaolong, J. K. Tuli		NDS 106, 159 (2005)	1-Apr-2005

1977Pa08: E=3.6-4.3 MeV, measured E γ , I γ , $\gamma(\theta)$, T_{1/2} by DSAM, γ -ray excitation functions.

1974Ca14: E=3.5 MeV, measured T_{1/2} by DSAM.

1971Mi21: E=2.2-3.1 MeV, measured $\gamma(\theta)$.

Others: 1976KrZO, 1966Re05.

⁶⁷Ga Levels

E(level) [†]	J π [#]	T _{1/2} [‡]	Comments
0.0	3/2 ⁻		
166.97 4	1/2 ⁻		
359.138 23	5/2 ⁻		
828.079 25	3/2 ⁻	0.24 ps +8-6	J=3/2 from $\gamma(\theta)$ and (p,n) cross-section.
910.929 18	5/2 ⁻	0.25 ps +9-5	J=5/2 from $\gamma(\theta)$ and (p,n) cross-section.
1081.63 5	1/2 ⁻	0.4 ps +4-1	J=1/2 from $\gamma(\theta)$ and (p,n) cross-section.
1202.274 24	7/2 ⁻	0.7 ps +6-2	J=7/2 from $\gamma(\theta)$.
1412.717 22	7/2 ⁻	0.9 ps +24-4	J=7/2 from $\gamma(\theta)$.
1519.19 4	9/2 ⁻	0.9 ps +24-4	J=9/2 from $\gamma(\theta)$ and (p,n) cross-section.
1554.61 3	5/2 ⁻	0.18 ps +5-3	J=5/2 from $\gamma(\theta)$ and (p,n) cross-section.
1639.40 6	3/2 ⁻	0.10 ps +4-2	J=3/2 from $\gamma(\theta)$ and (p,n) cross-section.
1808.99 6	3/2 ⁻	0.07 ps +3-2	J=3/2 from $\gamma(\theta)$ and (p,n) cross-section.
1977.90 5	5/2,7/2	0.3 ps +6-2	J=5/2 from $\gamma(\theta)$ and (p,n) cross-section.
2040.90 5	5/2 ⁻	0.09 ps +3-2	J=5/2 from $\gamma(\theta)$ and (p,n) cross-section.
2073.78 5	9/2 ⁺	≥0.21 ps	J=9/2 from $\gamma(\theta)$ and (p,n) cross-section.
2124.46 5	5/2 ⁻	0.21 ps +14-7	J=1/2, 5/2 from $\gamma(\theta)$ and (p,n) cross-section.
2141.85 8	3/2 ⁻	≥0.25 ps	J=3/2 from $\gamma(\theta)$ and (p,n) cross-section.
2145.38 22			J=1/2 compatible with the measured low (p,n) cross-section.
2172.13 7	(3/2) ⁻	0.18 ps +8-5	J=3/2 favored from $\gamma(\theta)$ and (p,n) cross-section.
2176.08 5	7/2 ⁻	0.06 ps +2-1	J=7/2 from $\gamma(\theta)$ and (p,n) cross-section.
2176.32? 8			J≤5/2 from $\gamma(\theta)$ and γ decay systematics; (p,n) cross-section compatible with J=1/2.
2190.65 6	9/2 ⁻	≥0.21 ps	J=9/2 from $\gamma(\theta)$.
2263.78 11	9/2 ⁻	0.08 ps +6-3	J=9/2 from $\gamma(\theta)$.
2281.94 9	7/2 ⁻	0.06 ps 2	J=7/2 from $\gamma(\theta)$.
2374.2? 3	3/2 ⁺ ,7/2 ⁺		
2407 4			

[†] From a least-squares fit to the E γ data.

[‡] From DSAM by 1977Pa08.

[#] From Adopted Levels; supporting arguments from this data set are indicated. They are based on the data of 1977Pa08.

⁶⁷Zn(p,n γ) 1977Pa08,1974Ca14,1971Mi21 (continued)

E _i (level)	J _i ^{π}	E _{γ} [†]	I _{γ} [#]	E _f	J _f ^{π}	Mult. [‡]	$\gamma(^{67}\text{Ga})$		Comments
							δ^{\ddagger}	$\alpha^{\textcircled{a}}$	
166.97	1/2 ⁻	167.01 5	100	0.0	3/2 ⁻	[M1]		0.01823	
359.138	5/2 ⁻	359.17 5	100	0.0	3/2 ⁻	M1+E2	-0.08 1		
828.079	3/2 ⁻	469.0 ^{&}		359.138	5/2 ⁻				
		661.05 10	9.8 4	166.97	1/2 ⁻	M1+E2	-0.36 9		
		828.09 3	90.2 40	0.0	3/2 ⁻	M1+E2	-0.14 4		
910.929	5/2 ⁻	551.80 15	2.1 2	359.138	5/2 ⁻	(M1(+E2))	+0.3 +10-5		
		743.85 10	2.1 2	166.97	1/2 ⁻	E2(+M3)	-0.03 7		
		910.92 2	95.8 40	0.0	3/2 ⁻	M1+E2	+0.32 2		
1081.63	1/2 ⁻	253.55 10	8.6 6	828.079	3/2 ⁻				
		914.68 4	68.7 33	166.97	1/2 ⁻	(M1)			
		1081.66 11	22.7 8	0.0	3/2 ⁻				
1202.274	7/2 ⁻	843.13 4	20.2 10	359.138	5/2 ⁻	M1+E2	-3.08 18		
		1202.24 3	79.8 30	0.0	3/2 ⁻	E2(+M3)	-0.00 2		
1412.717	7/2 ⁻	501.77 4	11.4 5	910.929	5/2 ⁻	M1+E2	-0.11 1		
		584.60 20	3.3 3	828.079	3/2 ⁻	E2			
		1053.58 4	28.7 11	359.138	5/2 ⁻	M1+E2	-2.0 1		
		1412.71 3	56.6 21	0.0	3/2 ⁻	E2(+M3)	-0.00 1		
1519.19	9/2 ⁻	1160.04 3	100	359.138	5/2 ⁻	E2(+M3)	-0.00 4		
1554.61	5/2 ⁻	643.69 20	5.6 5	910.929	5/2 ⁻				
		1195.49 4	45.7 17	359.138	5/2 ⁻	M1+E2	-0.65 3		$\delta = -0.24 +14-18$ or $+3.1 +24-10$ from ⁶⁷ Zn(p,n γ).
		1387.58 10	6.2 3	166.97	1/2 ⁻	E2			
		1554.57 4	42.5 16	0.0	3/2 ⁻	M1+E2	+0.42 4		$\delta = +0.69 +29-16$ or $+3.1 +18-12$ from ⁶⁷ Zn(p,n γ).
1639.40	3/2 ⁻	557.40 45	0.6 6	1081.63	1/2 ⁻				
		728.5	31.4	910.929	5/2 ⁻				
		811.2 2	6.4 4	828.079	3/2 ⁻				$\delta: \leq -0.3 \geq -1.7$ for M1+E2.
		1280.10 35	4.8 5	359.138	5/2 ⁻	(M1(+E2))	$\leq +0.5$		
		1472.48 6	51.2 20	166.97	1/2 ⁻	M1+E2	-0.16 2		$\delta = -0.30 +9-15$ or $-0.94 +22-17$ from ⁶⁷ Zn(p,n γ).
		1639.40 15	5.6 7	0.0	3/2 ⁻				
1808.99	3/2 ⁻	728.20 15	7.2 8	1081.63	1/2 ⁻				
		898.00 15	21.3 11	910.929	5/2 ⁻	(M1(+E2))	$\leq +0.41$		
		980.90 15	24.6 12	828.079	3/2 ⁻	(M1(+E2))	+0.8 +27-8		
		1449.88 15	9.9 6	359.138	5/2 ⁻	(M1(+E2))	$\leq +0.22$		
		1641.92 15	13.9 10	166.97	1/2 ⁻				
		1808.98 8	23.1 11	0.0	3/2 ⁻	(M1(+E2))	-0.26 26		
1977.90	5/2,7/2	339.5 2	2.3 3	1639.40	3/2 ⁻				
		423.3 2	3.8 3	1554.61	5/2 ⁻				
		775.66 6	36.8 14	1202.274	7/2 ⁻				
		1067.00 25	3.3 5	910.929	5/2 ⁻				
		1149.98 15	40.0 16	828.079	3/2 ⁻				
		1618.62 17	8.3 6	359.138	5/2 ⁻				
		1977.99 22	5.5 4	0.0	3/2 ⁻				
2040.90	5/2 ⁻	959.0 2	4.1 3	1081.63	1/2 ⁻	E2			

$\gamma(^{67}\text{Ga})$ (continued)

$E_i(\text{level})$	J_i^π	E_γ^\dagger	$I_\gamma^\#$	E_f	J_f^π	Mult. ‡	δ^\ddagger	Comments
2040.90	5/2 ⁻	1130.04	20 5.1 6	910.929	5/2 ⁻			
		1212.89	15 9.9 8	828.079	3/2 ⁻			
		1681.9	2 2.9 5	359.138	5/2 ⁻			
2073.78	9/2 ⁺	2040.86	5 78.0 32	0.0	3/2 ⁻	(M1+E2)	-0.7 3	
		554.61	6 40.1 20	1519.19	9/2 ⁻	E1(+M2)	-0.00 2	
		871.49	6 58.7 26	1202.274	7/2 ⁻	E1(+M2)	-0.00 2	
2124.46	5/2 ⁻	1714.5	5 1.2 6	359.138	5/2 ⁻			
		922.17	15 16.7 10	1202.274	7/2 ⁻			
		1296.41	7 31.5 14	828.079	3/2 ⁻	(M1+E2)	$\geq +0.2$	
		1765.26	8 2.2 4	359.138	5/2 ⁻	(M1+E2)	≤ -0.3	
2141.85	3/2 ⁻	1957.30	25 46.6 19	166.97	1/2 ⁻	E2		
		2124.30	38 3.0 3	0.0	3/2 ⁻			
		1230.90	15 18.3 16	910.929	5/2 ⁻			
		1313.8	2 13.1 12	828.079	3/2 ⁻			
		1782.67	15 15.9 14	359.138	5/2 ⁻			
2145.38	(3/2) ⁻	1974.82	16 41.1 29	166.97	1/2 ⁻	(M1+E2)	$\geq +0.5$	
		2141.85	20 11.6 9	0.0	3/2 ⁻			
		1317.1	3 36 10	828.079	3/2 ⁻			
		2145.53	30 64 10	0.0	3/2 ⁻			
2172.13	(3/2) ⁻	1344.16	14 19.4 14	828.079	3/2 ⁻	(M1(+E2))	$\leq +0.42$	
		1812.8	3 6.9 7	359.138	5/2 ⁻			
2176.08	7/2 ⁻	2172.07	7 73.7 38	0.0	3/2 ⁻			$\delta = -0.02$ 13 or 4 +4-2 for (M1(+E2)).
		763.3	2 5.8 7	1412.717	7/2 ⁻			
		1265.0	4 4.3 7	910.929	5/2 ⁻			
		1348.0	2 5.4 54	828.079	3/2 ⁻	(E2)		
		1816.92	8 32.3 23	359.138	5/2 ⁻	(M1(+E2))	+0.0 1	
2176.32?	9/2 ⁻	2176.05	7 52.2 35	0.0	3/2 ⁻	E2		
		1348.20	15 62 25	828.079	3/2 ⁻			
		2009.3	3 8 7	166.97	1/2 ⁻			
2190.65	9/2 ⁻	2176.3	1 10 10	0.0	3/2 ⁻			
		778.01	11 27.5 15	1412.717	7/2 ⁻	M1+E2	-0.06 3	
		988.35	10 21.5 14	1202.274	7/2 ⁻			Mult.: M1+E2. $\delta = +0.75$ 15 or +2.0 4.
2263.78	9/2 ⁻	1279.68	7 48.4 23	910.929	5/2 ⁻	E2(+M3)	-0.02 2	
		1831.51	30 2.6 5	359.138	5/2 ⁻	E2		
		1061.33	19 55.0 25	1202.274	7/2 ⁻	M1+E2	-2.4 2	
2281.94	7/2 ⁻	1352.90	12 45.0 24	910.929	5/2 ⁻	E2(+M3)	-0.02 4	
		1371.03	14 41.0 25	910.929	5/2 ⁻			Mult.: (M1(+E2)). δ : +0.08 9 or -7 +3-17. Mult.: M1+E2. $\delta = -0.28$ 10 or -1.9 4.
2374.2?	3/2 ⁺ , 7/2 ⁺	1922.77	12 55.0 25	359.138	5/2 ⁻			
		2281.8	3 4.0 6	0.0	3/2 ⁻			
		1463.3	3 3	910.929	5/2 ⁻			

$\gamma(^{67}\text{Ga})$ (continued)

<u>E_i(level)</u>	<u>J_i^{π}</u>	<u>E_{γ}[†]</u>	<u>I_{γ}[#]</u>	<u>E_f</u>	<u>J_f^{π}</u>
2407		2240 5	40 20	166.97	1/2 ⁻
		2407 5	60 20	0.0	3/2 ⁻

† From 1977Pa08.

‡ From adopted gammas.

Percent photon branching from each level (1977Pa08).

@ 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.

& Placement of transition in the level scheme is uncertain.

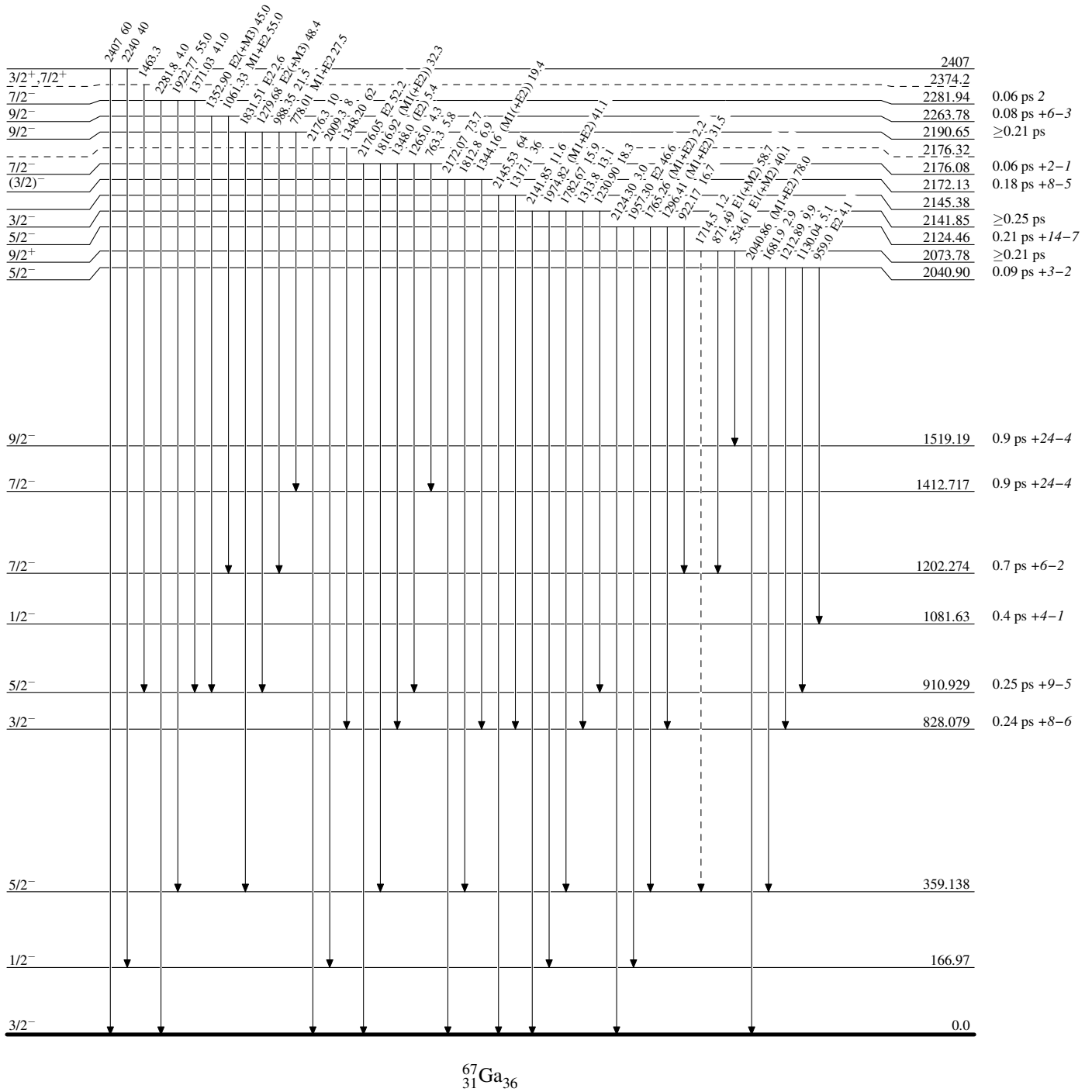
$^{67}\text{Zn}(p,n\gamma)$ 1977Pa08,1974Ca14,1971Mi21

Legend

Level Scheme

Intensities: % photon branching from each level

-----► γ Decay (Uncertain)



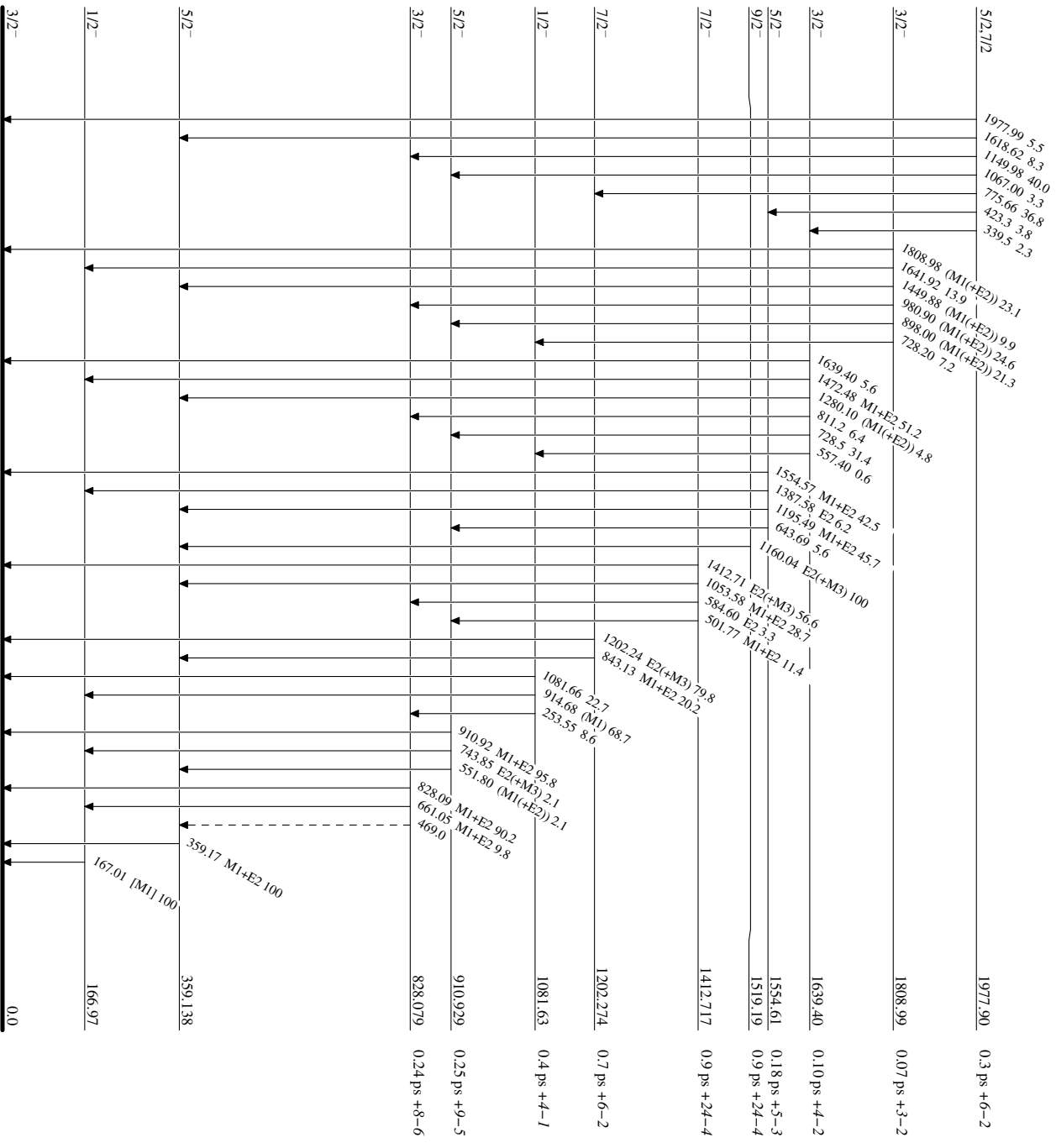
⁶⁷Zn(p,n γ) 1977Pa08,1974Ca14,1971Mi21

Legend

Level Scheme (continued)

Intensities: % photon branching from each level

-----▶ γ Decay (Uncertain)



⁶⁷Ga₃₆
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