^{69}Ga(p,nγ) 1978Pa15,1973Is02

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	C. D. Nesaraja	NDS 115, 1 (2014)	31-Jul-2013

1978Pa15: E(p)=3-5.6 MeV; Eγ, Iγ, γ(θ), excitation functions and $T_{1/2}$ by DSAM.
1973Is02: E(p)=3.4-5.0 MeV; Eγ, Iγ, α(exp) and excitation functions. In-beam sector field β^- spectrometer.
1970Ch05: γ(θ,H,t) and $T_{1/2}$ for the 398 level by stroboscopic observation of perturbed angular distributions.

^{69}Ge Levels

E(level)†	J^π‡	$T_{1/2}$#	Comments
0.0	$5/2^-$		
86.76 *2*	$1/2^-$		
232.66 *2*	$3/2^-$		
373.94 *2*	$3/2^-$		
397.94 *2*	$9/2^+$	2.84 μs *7*	$T_{1/2}$: from stroboscopic-resonance data (1970Ch05).
812.17 *2*	$5/2^+$		J^π: 5/2 from γ(θ) of 414γ and 438γ.
862.01 *3*	$7/2^-$	2.8 ps *14*	J^π: 7/2 from γ(θ) of 862γ and 629γ; this agrees with excitation function data.
933.14 *2*	$5/2^-$	1.5 ps *7*	J^π: 5/2 from γ(θ) of 559γ, 846γ and 933γ.
994.89 *4*	$1/2^-$	1.2 ps *7*	J^π: 1/2 from isotropic γ(θ) of 621γ, 762γ, and 995γ.
1159.89 *4*	$3/2^-$	1.2 ps *6*	J^π: 1/2 or 3/2 from γ(θ) of 1073γ and 927γ; excitation functions indicate 3/2 or 5/2.
1195.71 *4*	$5/2^-$	0.55 ps *14*	J^π: 5/2 consistent with γ(θ) of 822γ and 963γ; excitation functions favor J=3/2 or 5/2.
1210.11 *10*	$7/2^+$		J^π: 7/2 from γ(θ) of 812γ deexciting this level; excitation function favors J≤7/2.
1278.36 *5*	$1/2^-$,$3/2^-$	1.8 ps *12*	J^π: 1/2 or 3/2 from γ(θ) of 904γ; J=1/2 from excitation function.
1306.88 *4*	$3/2^-$	0.50 ps *17*	J^π: 1/2, 3/2 from γ(θ) of 1220γ and 1306γ; excitation function rules out 1/2 hence, prefer J=3/2.
1350.39 *8*	$11/2^+$	0.50 ps *11*	J^π: 11/2 or 13/2 from γ(θ) of 952γ; excitation function rules out J=13/2; hence prefer J=11/2.
1414.78 *6*	$5/2^-$	1.0 ps *4*	J^π: 5/2 from γ(θ) of 1414γ and 1182γ and excitation function.
1430.30 *10*	$9/2^-$	0.54 ps *14*	J^π: 9/2, 7/2 from γ(θ) of 1430γ; excitation function excludes J=7/2.
1432.60 *8*	$3/2^+$		J^π: 1/2 or 3/2 suggested by γ(θ) of 620γ and 1059γ; excitation function favors J=3/2.
1465.98 *8*	$9/2^+$	2.1 ps *14*	J^π: 9/2 from γ(θ) of 1068γ.
1478.73 *8*	$7/2^-$	0.30 ps *8*	J^π: 7/2, 5/2 from γ(θ) of 1479γ; γ(θ) of 1105γ consistent with J=7/2.
1539.26 *9*	$3/2^-$	0.35 ps *14*	J^π: 1/2, 3/2 from γ(θ) of 1452γ and 1165γ; excitation function excludes J=1/2.
1590.78 *12*	$7/2^+$	2.1 ps *14*	J^π: 5/2, 7/2, and 9/2 from γ(θ) of 779γ; excitation function excludes J=5/2 and 9/2.
1601.22 *10*	$5/2^+$	0.52 ps *17*	J^π: 5/2, 7/2 from γ(θ) of 789γ; J=3/2, 5/2 from γ(θ) of 1227γ.
1611.13 *23*	$5/2^-$		J^π: 5/2 or 7/2 from γ(θ) and excitation functions of 1378γ and 1611γ.
1613.3 *3*	$7/2^-$		J^π: 7/2 compatible with γ(θ) and excitation functions of 1381γ and 1614γ.
1666.13 *16*	$1/2^{(-)}$		J^π: 1/2 very likely from γ(θ) and excitation function of 1433γ.
1725.8 *3*	$1/2^-$,$3/2^-$		
1763.6 *4*	$1/2^+$		
1767.2 *3*	$3/2^-$		
1891.3 *3*	$3/2^-$		

† From least-squares fit to Eγ data.
‡ From Adopted Levels; supporting arguments from this reaction are indicated. These are from 1978Pa15, unless indicated otherwise.
# From DSA at E=4.2-4.8 MeV, 1978Pa15, except as noted.

^{69}Ga(p,nγ) 1978Pa15,1973Is02 (continued)

γ(^{69}Ge)

E_γ[‡]	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	δ[a]	α[e]	Branching ratio[†]	Comments
86.76 *3*	91	86.76	1/2$^-$	0.0	5/2$^-$	E2[b]		1.268	100	α(K)exp=1.61 *11* ce(K)/(γ+ce)=0.483 *4*; ce(L)/(γ+ce)=0.0655 *10*; ce(M)/(γ+ce)=0.00965 *16* ce(N)/(γ+ce)=0.000473 *8* α(K)=1.096 *16*; α(L)=0.1485 *21*; α(M)=0.0219 *3* α(N)=0.001072 *15* α(L+...)exp=0.26 *2*.
[x]118.9 *2*	2.6									
141.30 *10*		373.94	3/2$^-$	232.66	3/2$^-$	[M1]		0.0315	2.0 *4*	ce(K)/(γ+ce)=0.0272 *4*; ce(L)/(γ+ce)=0.00288 *4*; ce(M)/(γ+ce)=0.000431 *6* ce(N)/(γ+ce)=2.80×10^{-5} *4* α(K)=0.0280 *4*; α(L)=0.00297 *5*; α(M)=0.000444 *7* α(N)=2.88×10^{-5} *4* α(K)exp=0.016 *2* I_γ: adopted gammas Iγ(141): Iγ(287)=4.6:100. α(L+...)exp=0.0022 *10*. Mult.: mult is E1 based on α(K)exp. However, mult=M1 is required by the decay scheme. α(theory)=0.032(M1), 0.025(E1). Note that α(exp) is smaller than α(E1 theory).
145.93 *5*	41	232.66	3/2$^-$	86.76	1/2$^-$	M1+E2[b]	+0.19 *7*	0.034 *5*	31 *1*	α(K)exp=0.0233 *15* ce(K)/(γ+ce)=0.029 *4*; ce(L)/(γ+ce)=0.0032 *5*; ce(M)/(γ+ce)=0.00047 *7* ce(N)/(γ+ce)=3.0×10^{-5} *4* α(K)=0.030 *4*; α(L)=0.0033 *5*; α(M)=0.00049 *7* α(N)=3.1×10^{-5} *4* α(L+...)exp=0.00247 *251*.
232.66 *3*	76	232.66	3/2$^-$	0.0	5/2$^-$	M1+E2[b]	+0.27 *4*	0.0103 *5*		α(K)exp=0.0101 *8* α(K)=0.0092 *5*; α(L)=0.00097 *5*; α(M)=0.000145 *7* α(N)=9.3×10^{-6} *5* α(L+...)exp=0.00116 *14*.
255.7 *5*		1465.98	9/2$^+$	1210.11	7/2$^+$				9 *2*	
287.18 *3*	100	373.94	3/2$^-$	86.76	1/2$^-$	M1+E2[b]	+0.11 *1*	0.00529	73 *1*	α(K)exp=0.0044 *3* ce(K)/(γ+ce)=0.00470 *7*; ce(L)/(γ+ce)=0.000490 *8*; ce(M)/(γ+ce)=7.32×10^{-5} *11* ce(N)/(γ+ce)=4.78×10^{-6} *7* α(K)=0.00472 *7*; α(L)=0.000493 *8*; α(M)=7.36×10^{-5} *11* α(N)=4.80×10^{-6} *7* α(L+...)exp=0.00060 *9*.

$^{69}_{32}Ge_{37}$-2

^{69}Ga(p,nγ) 1978Pa15,1973Is02 (continued)

γ(^{69}Ge) (continued)

E_γ[‡]	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	δ[a]	α[e]	Branching ratio[†]	Comments
373.93 *3*	36	373.94	3/2⁻	0.0	5/2⁻	M1+E2[b]	−0.17 *9*	0.00283 *13*	25 *1*	α(K)exp=0.0026 *4* ce(K)/(γ+ce)=0.00252 *11*; ce(L)/(γ+ce)=0.000261 *12*; ce(M)/(γ+ce)=3.90×10^{-5} *18* ce(N)/(γ+ce)=2.55×10^{-6} *11* α(K)=0.00253 *11*; α(L)=0.000262 *12*; α(M)=3.92×10^{-5} *18* α(N)=2.56×10^{-6} *11*
391.0[g]		1601.22	5/2⁺	1210.11	7/2⁺					E$_\gamma$: Given in decay scheme of 1978Pa15 but not in their Table.
397.9[f g]	≈0.6[f c]	1210.11	7/2⁺	812.17	5/2⁺				98 *2*	E$_\gamma$: Given in decay scheme of 1978Pa15 but not in their Table.
397.94[f] *3*	88[f]	397.94	9/2⁺	0.0	5/2⁻	M2[b]		0.00874	100	α(K)exp=0.0067 *5* ce(K)/(γ+ce)=0.00770 *11*; ce(L)/(γ+ce)=0.000832 *12*; ce(M)/(γ+ce)=0.0001246 *18* ce(N)/(γ+ce)=8.08×10^{-6} *12* α(K)=0.00777 *11*; α(L)=0.000839 *12*; α(M)=0.0001257 *18* α(N)=8.15×10^{-6} *12* α(L+...)exp=0.00090 *12*.
414.24 *3*	15	812.17	5/2⁺	397.94	9/2⁺	E2(+M3)[b]	+0.03 *3*	0.00431 *9*	18 *1*	α(K)exp=0.0044 *8* ce(K)/(γ+ce)=0.00382 *8*; ce(L)/(γ+ce)=0.000405 *9*; ce(M)/(γ+ce)=6.03×10^{-5} *13* ce(N)/(γ+ce)=3.80×10^{-6} *8* α(K)=0.00384 *8*; α(L)=0.000407 *9*; α(M)=6.06×10^{-5} *13* α(N)=3.82×10^{-6} *8*
438.25 *7*		812.17	5/2⁺	373.94	3/2⁻	(E1+M2)	−0.02 *2*	9.83×10^{-4} *16*	22 *1*	ce(K)/(γ+ce)=0.000878 *14*; ce(L)/(γ+ce)=8.97×10^{-5} *15*; ce(M)/(γ+ce)=1.337×10^{-5} *21* ce(N)/(γ+ce)=8.67×10^{-7} *14* α(K)=0.000879 *14*; α(L)=8.98×10^{-5} *15*; α(M)=1.338×10^{-5} *21* α(N)=8.68×10^{-7} *14* I$_\gamma$: Seen by 1973Is02 but unresolved from impurity line.
463.9 *6*		862.01	7/2⁻	397.94	9/2⁺				1.3 *6*	
545.50 *20*	1.6	1478.73	7/2⁻	933.14	5/2⁻	(M1+E2)		0.0015 *4*	11 *2*	ce(K)/(γ+ce)=0.0013 *3*; ce(L)/(γ+ce)=0.00014 *4*;

$^{69}_{32}Ge_{37}$-3

^{69}Ga(p,nγ) 1978Pa15,1973Is02 (continued)

γ(^{69}Ge) (continued)

E_γ[‡]	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	δ[a]	α[e]	Branching ratio[†]	Comments
										ce(M)/(γ+ce)=2.0×10^{-5} *5* ce(N)/(γ+ce)=1.3×10^{-6} *3* α(K)=0.0013 *3*; α(L)=0.00014 *4*; α(M)=2.0×10^{-5} *5* α(N)=1.3×10^{-6} *3* δ: +0.05 *5* for J(1479)=7/2.
[x]553.25 *10*										
559.14 *4*	6.9	933.14	5/2$^-$	373.94	3/2$^-$	M1+E2[&]		0.0014 *3*	16.2 *6*	ce(K)/(γ+ce)=0.0012 *3*; ce(L)/(γ+ce)=0.00013 *3*; ce(M)/(γ+ce)=1.9×10^{-5} *5* ce(N)/(γ+ce)=1.2×10^{-6} *3* α(K)=0.0012 *3*; α(L)=0.00013 *3*; α(M)=1.9×10^{-5} *5* α(N)=1.2×10^{-6} *3* δ: −0.35 *10* or +1.4 *4*.
579.4 *3*		812.17	5/2$^+$	232.66	3/2$^-$				2.0 *5*	
620.42 *10*		1432.60	3/2$^+$	812.17	5/2$^+$	D+Q	−0.6 *4*		74 *2*	I$_\gamma$: Iγ=18 for unresolved 620.98+620.42 γ's.
620.98 *18*		994.89	1/2$^-$	373.94	3/2$^-$	(M1)		8.56×10^{-4}	25 *1*	ce(K)/(γ+ce)=0.000765 *11*; ce(L)/(γ+ce)=7.84×10^{-5} *11*; ce(M)/(γ+ce)=1.171×10^{-5} *17* ce(N)/(γ+ce)=7.71×10^{-7} *11* α(K)=0.000765 *11*; α(L)=7.84×10^{-5} *11*; α(M)=1.172×10^{-5} *17* α(N)=7.72×10^{-7} *11*
629.38 *7*		862.01	7/2$^-$	232.66	3/2$^-$	E2(+M3)[&]	+0.0 *1*	0.00118 *6*	4.3 *4*	I$_\gamma$: Iγ=18 for unresolved 620.98+620.42 γ's. ce(K)/(γ+ce)=0.00106 *5*; ce(L)/(γ+ce)=0.000110 *6*; ce(M)/(γ+ce)=1.64×10^{-5} *8* ce(N)/(γ+ce)=1.05×10^{-6} *5* α(K)=0.00106 *5*; α(L)=0.000110 *6*; α(M)=1.64×10^{-5} *8* α(N)=1.06×10^{-6} *5*
653.7 *3*		1465.98	9/2$^+$	812.17	5/2$^+$	E2[&]		1.06×10^{-3}	6 *2*	ce(K)/(γ+ce)=0.000948 *14*; ce(L)/(γ+ce)=9.85×10^{-5} *14*; ce(M)/(γ+ce)=1.469×10^{-5} *21* ce(N)/(γ+ce)=9.47×10^{-7} *14* α(K)=0.000949 *14*; α(L)=9.86×10^{-5} *14*; α(M)=1.471×10^{-5} *21* α(N)=9.48×10^{-7} *14*
[x]692.9 *2*										
700.67 *10*	2.1	933.14	5/2$^-$	232.66	3/2$^-$				4.5 *4*	

^{69}Ga(p,nγ) 1978Pa15,1973Is02 (continued)

γ(^{69}Ge) (continued)

E_γ[‡]	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	δ[a]	α[e]	Branching ratio[†]	Comments
[x]709.8 *2*	2.6									
762.22 *3*	13	994.89	1/2$^-$	232.66	3/2$^-$	(M1)		5.48×10^{-4}	69 *1*	ce(K)/(γ+ce)=0.000490 *7*; ce(L)/(γ+ce)=5.00×10^{-5} *7*; ce(M)/(γ+ce)=7.47×10^{-6} *11* ce(N)/(γ+ce)=4.93×10^{-7} *7* α(K)=0.000490 *7*; α(L)=5.01×10^{-5} *7*; α(M)=7.48×10^{-6} *11* α(N)=4.93×10^{-7} *7*
778.62 *12*	5.2[d]	1590.78	7/2$^+$	812.17	5/2$^+$	M1+E2[&]	+0.48 *6*	5.49×10^{-4} *10*	76 *3*	ce(K)/(γ+ce)=0.000491 *9*; ce(L)/(γ+ce)=5.02×10^{-5} *9*; ce(M)/(γ+ce)=7.50×10^{-6} *13* ce(N)/(γ+ce)=4.93×10^{-7} *9* α(K)=0.000491 *9*; α(L)=5.03×10^{-5} *9*; α(M)=7.51×10^{-6} *13* α(N)=4.93×10^{-7} *9* δ: large solution ruled out by (HI,xnγ).
789.03 *11*		1601.22	5/2$^+$	812.17	5/2$^+$	M1+E2[&]		0.00057 *7*	55 *2*	ce(K)/(γ+ce)=0.00051 *6*; ce(L)/(γ+ce)=5.3×10^{-5} *7*; ce(M)/(γ+ce)=7.9×10^{-6} *10* ce(N)/(γ+ce)=5.1×10^{-7} *6* α(K)=0.00051 *6*; α(L)=5.3×10^{-5} *7*; α(M)=7.9×10^{-6} *10* α(N)=5.1×10^{-7} *6* δ: +0.36 *13* or +0.8 *+4−2*.
812.16[f] *3*	62[fc]	812.17	5/2$^+$	0.0	5/2$^-$	(E1+M2)	−0.13 *3*	2.48×10^{-4} *9*	58 *2*	ce(K)/(γ+ce)=0.000222 *8*; ce(L)/(γ+ce)=2.26×10^{-5} *9*; ce(M)/(γ+ce)=3.37×10^{-6} *13* ce(N)/(γ+ce)=2.21×10^{-7} *8* α(K)=0.000222 *8*; α(L)=2.26×10^{-5} *9*; α(M)=3.37×10^{-6} *13* α(N)=2.21×10^{-7} *8*
812.16[f] *10*	12[fc]	1210.11	7/2$^+$	397.94	9/2$^+$	D+Q				δ: −0.33 *10* or −2.2 *5*.
821.75 *3*	19.5	1195.71	5/2$^-$	373.94	3/2$^-$	M1+E2[&]		0.00052 *6*	67 *1*	ce(K)/(γ+ce)=0.00046 *5*; ce(L)/(γ+ce)=4.8×10^{-5} *6*; ce(M)/(γ+ce)=7.1×10^{-6} *8* ce(N)/(γ+ce)=4.7×10^{-7} *5* α(K)=0.00047 *5*; α(L)=4.8×10^{-5} *6*; α(M)=7.1×10^{-6} *8* α(N)=4.7×10^{-7} *5* δ: −0.50 *5* or −1.1 *1*.

$^{69}_{32}Ge_{37}$-5

^{69}Ga(p,nγ) 1978Pa15,1973Is02 (continued)

γ(^{69}Ge) (continued)

E_γ[‡]	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	δ[a]	α[e]	Branching ratio[†]	Comments
846.43 *8*		933.14	5/2$^-$	86.76	1/2$^-$	E2(+M3)[&]	+0.05 *10*	0.00054 *4*	18.7 *9*	ce(K)/(γ+ce)=0.00048 *4*; ce(L)/(γ+ce)=4.9×10^{-5} *4*; ce(M)/(γ+ce)=7.4×10^{-6} *6* ce(N)/(γ+ce)=4.8×10^{-7} *4* α(K)=0.00048 *4*; α(L)=4.9×10^{-5} *4*; α(M)=7.4×10^{-6} *6* α(N)=4.8×10^{-7} *4*
862.00 *3*	23	862.01	7/2$^-$	0.0	5/2$^-$	M1+E2[&]	+2.4 *3*	4.96×10^{-4} *8*	94.8 *8*	ce(K)/(γ+ce)=0.000443 *7*; ce(L)/(γ+ce)=4.55×10^{-5} *7*; ce(M)/(γ+ce)=6.79×10^{-6} *11* ce(N)/(γ+ce)=4.43×10^{-7} *7* α(K)=0.000443 *7*; α(L)=4.55×10^{-5} *7*; α(M)=6.79×10^{-6} *11* α(N)=4.43×10^{-7} *7*
904.45 *5*	5.7	1278.36	1/2$^-$,3/2$^-$	373.94	3/2$^-$				33 *2*	
[x]913.75 *20*										
927.18 *6*	5.4	1159.89	3/2$^-$	232.66	3/2$^-$	(M1+E2)	−0.6 *+3−24*	0.00038 *4*	14 *1*	ce(K)/(γ+ce)=0.00034 *4*; ce(L)/(γ+ce)=3.5×10^{-5} *4*; ce(M)/(γ+ce)=5.2×10^{-6} *6* ce(N)/(γ+ce)=3.4×10^{-7} *4* α(K)=0.00034 *4*; α(L)=3.5×10^{-5} *4*; α(M)=5.2×10^{-6} *6* α(N)=3.4×10^{-7} *4*
933.13 *3*	27	933.14	5/2$^-$	0.0	5/2$^-$	M1+E2[&]		0.00039 *3*	60.6 *9*	ce(K)/(γ+ce)=0.00035 *3*; ce(L)/(γ+ce)=3.5×10^{-5} *3*; ce(M)/(γ+ce)=5.3×10^{-6} *5* ce(N)/(γ+ce)=3.5×10^{-7} *3* α(K)=0.00035 *3*; α(L)=3.5×10^{-5} *3*; α(M)=5.3×10^{-6} *5* α(N)=3.5×10^{-7} *3* δ: +0.21 *8* or +1.06 *20*.
952.45 *7*	6.1	1350.39	11/2$^+$	397.94	9/2$^+$	M1+E2[&]	+0.55 *3*	3.55×10^{-4}	100	ce(K)/(γ+ce)=0.000318 *5*; ce(L)/(γ+ce)=3.24×10^{-5} *5*; ce(M)/(γ+ce)=4.84×10^{-6} *7* ce(N)/(γ+ce)=3.19×10^{-7} *5* α(K)=0.000318 *5*; α(L)=3.24×10^{-5} *5*; α(M)=4.84×10^{-6} *7* α(N)=3.19×10^{-7} *5*
963.08 *11*	8.1	1195.71	5/2$^-$	232.66	3/2$^-$	M1+E2[&]		0.00036 *3*	8.0 *5*	ce(K)/(γ+ce)=0.000323 *24*;

^{69}Ga(p,nγ) 1978Pa15,1973Is02 (continued)

γ(^{69}Ge) (continued)

E_γ[‡]	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	δ[a]	α[e]	Branching ratio[†]	Comments
										ce(L)/(γ+ce)=3.3×10^{-5} *3*; ce(M)/(γ+ce)=4.9×10^{-6} *4* ce(N)/(γ+ce)=3.23×10^{-7} *23* α(K)=0.000323 *24*; α(L)=3.3×10^{-5} *3*; α(M)=4.9×10^{-6} *4* α(N)=3.23×10^{-7} *23* δ: −0.27 *15* or −1.6 *+5−10*.
[x]991.2 *2*	2.8									
994.87 *17*	2.8	994.89	1/2$^-$	0.0	5/2$^-$	E2[&]		3.58×10^{-4}	6 *1*	ce(K)/(γ+ce)=0.000320 *5*; ce(L)/(γ+ce)=3.28×10^{-5} *5*; ce(M)/(γ+ce)=4.89×10^{-6} *7* ce(N)/(γ+ce)=3.20×10^{-7} *5* α(K)=0.000320 *5*; α(L)=3.28×10^{-5} *5*; α(M)=4.90×10^{-6} *7* α(N)=3.20×10^{-7} *5*
[x]1014.5 *3*										
1041.6 *3*	3.6	1414.78	5/2$^-$	373.94	3/2$^-$				19 *2*	
1045.50 *20*	3.6	1278.36	1/2$^-$,3/2$^-$	232.66	3/2$^-$				32 *2*	
1058.65 *13*	1.8	1432.60	3/2$^+$	373.94	3/2$^-$				17 *2*	
1068.05 *8*	10.3	1465.98	9/2$^+$	397.94	9/2$^+$	M1+E2[&]	−1.43 *10*	2.93×10^{-4} *5*	85 *3*	ce(K)/(γ+ce)=0.000262 *4*; ce(L)/(γ+ce)=2.67×10^{-5} *4*; ce(M)/(γ+ce)=3.99×10^{-6} *6* ce(N)/(γ+ce)=2.62×10^{-7} *4* α(K)=0.000262 *4*; α(L)=2.67×10^{-5} *4*; α(M)=3.99×10^{-6} *6* α(N)=2.62×10^{-7} *4*
1073.11 *4*	19.6	1159.89	3/2$^-$	86.76	1/2$^-$	M1+E2[&]	+0.31 *6*	2.71×10^{-4}	68 *1*	ce(K)/(γ+ce)=0.000243 *4*; ce(L)/(γ+ce)=2.47×10^{-5} *4*; ce(M)/(γ+ce)=3.69×10^{-6} *6* ce(N)/(γ+ce)=2.43×10^{-7} *4* α(K)=0.000243 *4*; α(L)=2.47×10^{-5} *4*; α(M)=3.69×10^{-6} *6* α(N)=2.43×10^{-7} *4*
1105.20 *20*		1478.73	7/2$^-$	373.94	3/2$^-$	E2[&]		2.81×10^{-4}	29 *2*	ce(K)/(γ+ce)=0.000251 *4*; ce(L)/(γ+ce)=2.56×10^{-5} *4*; ce(M)/(γ+ce)=3.83×10^{-6} *6* ce(N)/(γ+ce)=2.50×10^{-7} *4*; α(IPF)/$T_{1/2}$=9.18×10^{-7} *14* α(K)=0.000251 *4*; α(L)=2.56×10^{-5} *4*; α(M)=3.83×10^{-6} *6* α(N)=2.50×10^{-7} *4*; α(IPF)=9.18×10^{-7} *14* δ: δ(O/Q)=−0.05 *6*.

$^{69}_{32}Ge_{37}$-7

^{69}Ga(p,nγ) 1978Pa15,1973Is02 (continued)

γ(^{69}Ge) (continued)

E_γ[‡]	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	δ[a]	α[e]	Branching ratio[†]	Comments
1159.94 *6*	5.5	1159.89	3/2⁻	0.0	5/2⁻	(M1)		2.32×10^{-4}	18 *1*	ce(K)/(γ+ce)=0.000205 *3*; ce(L)/(γ+ce)=2.09×10^{-5} *3*; ce(M)/(γ+ce)=3.11×10^{-6} *5* ce(N)/(γ+ce)=2.06×10^{-7} *3*; α(IPF)/$T_{1/2}$=2.81×10^{-6} *4* α(K)=0.000205 *3*; α(L)=2.09×10^{-5} *3*; α(M)=3.12×10^{-6} *5* α(N)=2.06×10^{-7} *3*; α(IPF)=2.81×10^{-6} *4*
1165.30 *13*	4.2	1539.26	3/2⁻	373.94	3/2⁻	(M1)		2.31×10^{-4}	30 *2*	ce(K)/(γ+ce)=0.000204 *3*; ce(L)/(γ+ce)=2.07×10^{-5} *3*; ce(M)/(γ+ce)=3.09×10^{-6} *5* ce(N)/(γ+ce)=2.04×10^{-7} *3*; α(IPF)/$T_{1/2}$=3.17×10^{-6} *5* α(K)=0.000204 *3*; α(L)=2.07×10^{-5} *3*; α(M)=3.09×10^{-6} *5* α(N)=2.04×10^{-7} *3*; α(IPF)=3.17×10^{-6} *5*
1182.10 *11*	3.4	1414.78	5/2⁻	232.66	3/2⁻	M1+E2[&]	+0.49 *10*	2.30×10^{-4}	15 *1*	ce(K)/(γ+ce)=0.000201 *3*; ce(L)/(γ+ce)=2.05×10^{-5} *4*; ce(M)/(γ+ce)=3.05×10^{-6} *5* ce(N)/(γ+ce)=2.02×10^{-7} *3*; α(IPF)/$T_{1/2}$=4.82×10^{-6} *13* α(K)=0.000201 *3*; α(L)=2.05×10^{-5} *4*; α(M)=3.05×10^{-6} *5* α(N)=2.02×10^{-7} *3*; α(IPF)=4.82×10^{-6} *13*
1191.54 *10*		1278.36	1/2⁻,3/2⁻	86.76	1/2⁻				19 *2*	
1192.7 *3*	7.0[d]	1590.78	7/2⁺	397.94	9/2⁺				24 *2*	
1195.78 *10*	5.1	1195.71	5/2⁻	0.0	5/2⁻	D+Q			25 *1*	δ: −0.1 *4* or −2.0 *+10−37*.
1199.7 *5*		1432.60	3/2⁺	232.66	3/2⁻				6 *1*	
1210.0 *5*	≈0.6[c]	1210.11	7/2⁺	0.0	5/2⁻				2 *2*	
1220.12 *5*	10.2	1306.88	3/2⁻	86.76	1/2⁻	M1+E2[&]	+0.3 *1*	2.18×10^{-4} *4*	49 *1*	ce(K)/(γ+ce)=0.000187 *3*; ce(L)/(γ+ce)=1.90×10^{-5} *3*; ce(M)/(γ+ce)=2.84×10^{-6} *5* ce(N)/(γ+ce)=1.87×10^{-7} *3*; α(IPF)/$T_{1/2}$=8.85×10^{-6} *22* α(K)=0.000187 *3*; α(L)=1.90×10^{-5} *3*; α(M)=2.84×10^{-6} *5* α(N)=1.87×10^{-7} *3*; α(IPF)=8.86×10^{-6} *22*
1227.4 *3*		1601.22	5/2⁺	373.94	3/2⁻	D(+Q)	+0.09 *10*		19 *2*	
1237.0 *6*		1611.13	5/2⁻	373.94	3/2⁻				9 *2*	Eγ: uncertainty given as 6 keV in 1978Pa15 is assumed by the evaluator to be a misprint.

$^{69}_{32}Ge_{37}$-8

^{69}Ga(p,nγ) 1978Pa15,1973Is02 (continued)

γ(^{69}Ge) (continued)

E_γ[‡]	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	δ[a]	α[e]	Branching ratio[†]	Comments
1239.0 *6*		1613.3	7/2$^-$	373.94	3/2$^-$				7 *2*	E_γ: uncertainty given as 6 keV in 1978Pa15 is assumed by the evaluator to be a misprint.
1245.9 *4*		1478.73	7/2$^-$	232.66	3/2$^-$				7 *2*	
1278.23 *25*	2.3	1278.36	1/2$^-$,3/2$^-$	0.0	5/2$^-$				16 *2*	
1306.85 *5*	13.2	1306.88	3/2$^-$	0.0	5/2$^-$	(M1(+E2))	+0.0 *1*	2.04×10^{-4}	51 *1*	ce(K)/(γ+ce)=0.0001623 *23*; ce(L)/(γ+ce)=1.646×10^{-5} *23*; ce(M)/(γ+ce)=2.46×10^{-6} *4* ce(N)/(γ+ce)=1.625×10^{-7} *23*; α(IPF)/$T_{1/2}$=2.22×10^{-5} *4* α(K)=0.0001623 *23*; α(L)=1.646×10^{-5} *23*; α(M)=2.46×10^{-6} *4* α(N)=1.625×10^{-7} *23*; α(IPF)=2.22×10^{-5} *4*
[x]1336.8 *2*	1.6									
1346.1 *6*		1432.60	3/2$^+$	86.76	1/2$^-$				3 *1*	
1351.7 *5*	2.2	1725.8	1/2$^-$,3/2$^-$	373.94	3/2$^-$				23 *2*	
[x]1368.8 *3*	3.9									
1378.4 *3*	5.9	1611.13	5/2$^-$	232.66	3/2$^-$	M1+E2	+1.3 *2*	2.13×10^{-4} *4*	61 *3*	ce(K)/(γ+ce)=0.0001518 *23*; ce(L)/(γ+ce)=1.543×10^{-5} *23*; ce(M)/(γ+ce)=2.30×10^{-6} *4* ce(N)/(γ+ce)=1.517×10^{-7} *23*; α(IPF)/$T_{1/2}$=4.31×10^{-5} *11* α(K)=0.0001519 *23*; α(L)=1.543×10^{-5} *23*; α(M)=2.30×10^{-6} *4* α(N)=1.517×10^{-7} *23*; α(IPF)=4.31×10^{-5} *11* Mult.: J=5/2 is adopted.
1380.7 *4*	3.9	1613.3	7/2$^-$	232.66	3/2$^-$	Q+O	−0.03 *4*		48 *3*	
1389.5 *5*		1763.6	1/2$^+$	373.94	3/2$^-$				52 *4*	
1414.73 *6*	15.1	1414.78	5/2$^-$	0.0	5/2$^-$	M1+E2[&]	−0.65 *10*	2.06×10^{-4} *4*	65 *2*	ce(K)/(γ+ce)=0.0001415 *21*; ce(L)/(γ+ce)=1.435×10^{-5} *21*; ce(M)/(γ+ce)=2.14×10^{-6} *4* ce(N)/(γ+ce)=1.414×10^{-7} *21*; α(IPF)/$T_{1/2}$=4.80×10^{-5} *11* α(K)=0.0001415 *21*; α(L)=1.436×10^{-5} *21*; α(M)=2.14×10^{-6} *4* α(N)=1.415×10^{-7} *21*; α(IPF)=4.80×10^{-5} *11*
1430.28 *10*	7.8	1430.30	9/2$^-$	0.0	5/2$^-$	E2(+M3)[&]	−0.02 *3*	2.23×10^{-4}	100	ce(K)/(γ+ce)=0.0001438 *22*; ce(L)/(γ+ce)=1.463×10^{-5} *22*; ce(M)/(γ+ce)=2.18×10^{-6} *4* ce(N)/(γ+ce)=1.435×10^{-7} *22*;

$^{69}_{32}Ge_{37}$-9

^{69}Ga(p,nγ) 1978Pa15,1973Is02 (continued)

γ(^{69}Ge) (continued)

E_γ[‡]	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	δ[a]	α[e]	Branching ratio[†]	Comments
										α(IPF)/$T_{1/2}$=6.21×10^{-5} *9* α(K)=0.0001439 *22*; α(L)=1.463×10^{-5} *22*; α(M)=2.18×10^{-6} *4* α(N)=1.435×10^{-7} *22*; α(IPF)=6.21×10^{-5} *9*
1433.45 *15*	5.2	1666.13	1/2$^{(-)}$	232.66	3/2$^-$				100	E_γ: this γ is reported in 1973Is02 as originating from a level at 1433 keV.
1452.46 *13*	6.1	1539.26	3/2$^-$	86.76	1/2$^-$	M1+E2[&]	−0.45 *25*	2.05×10^{-4} *5*	49 *2*	ce(K)/(γ+ce)=0.0001335 *22*; ce(L)/(γ+ce)=1.353×10^{-5} *23*; ce(M)/(γ+ce)=2.02×10^{-6} *4* ce(N)/(γ+ce)=1.335×10^{-7} *22*; α(IPF)/$T_{1/2}$=5.6×10^{-5} *3* α(K)=0.0001335 *22*; α(L)=1.353×10^{-5} *23*; α(M)=2.02×10^{-6} *4* α(N)=1.335×10^{-7} *22*; α(IPF)=5.6×10^{-5} *3*
1478.65 *9*	9.6	1478.73	7/2$^-$	0.0	5/2$^-$	(M1+E2)		2.16×10^{-4} *13*	52 *2*	ce(K)/(γ+ce)=0.000131 *4*; ce(L)/(γ+ce)=1.33×10^{-5} *4*; ce(M)/(γ+ce)=1.99×10^{-6} *6* ce(N)/(γ+ce)=1.31×10^{-7} *4*; α(IPF)/$T_{1/2}$=6.9×10^{-5} *9* α(K)=0.000131 *4*; α(L)=1.33×10^{-5} *4*; α(M)=1.99×10^{-6} *6* α(N)=1.31×10^{-7} *4*; α(IPF)=7.0×10^{-5} *9* δ: +0.05 *2* or +4.8 *8* for J(1479)=7/2.
[x]1488.2 *3*	1.6									
1534.6 *4*	2.1	1767.2	3/2$^-$	232.66	3/2$^-$				39 *3*	
1539.5 *3*	1.4	1539.26	3/2$^-$	0.0	5/2$^-$				21 *2*	
1601.2 *3*	2.4	1601.22	5/2$^+$	0.0	5/2$^-$	D+Q	−0.06 *6*		26 *2*	
1611.3 *4*	4.2	1611.13	5/2$^-$	0.0	5/2$^-$	(M1+E2)	+1.7 *+3−8*	2.50×10^{-4} *10*	30 *3*	ce(K)/(γ+ce)=0.0001120 *21*; ce(L)/(γ+ce)=1.136×10^{-5} *22*; ce(M)/(γ+ce)=1.69×10^{-6} *4* ce(N)/(γ+ce)=1.117×10^{-7} *20*; α(IPF)/$T_{1/2}$=0.000124 *9* α(K)=0.0001120 *21*; α(L)=1.136×10^{-5} *22*; α(M)=1.70×10^{-6} *4* α(N)=1.117×10^{-7} *20*; α(IPF)=0.000124 *9* Mult.: J=5/2 is adopted.
1613.5 *5*	5.9	1613.3	7/2$^-$	0.0	5/2$^-$	D+Q	−0.05 *3*		45 *3*	
1639.0 *5*	3.8	1725.8	1/2$^-$,3/2$^-$	86.76	1/2$^-$				57 *3*	
[x]1650.5 *3*	3.1									
1658.2 *5*	1.2	1891.3	3/2$^-$	232.66	3/2$^-$				42 *3*	
1677.0 *7*	1.5	1763.6	1/2$^+$	86.76	1/2$^-$				48 *4*	

^{69}Ga(p,nγ) 1978Pa15,1973Is02 (continued)

γ(^{69}Ge) (continued)

E_γ[‡]	I_γ[#]	E_i(level)	J_i^π	E_f	J_f^π	Branching ratio[†]
1680.1 *7*	3.6	1767.2	3/2$^-$	86.76	1/2$^-$	23 *3*
1726.0 *5*		1725.8	1/2$^-$,3/2$^-$	0.0	5/2$^-$	20 *2*
1767.3 *5*	3.0	1767.2	3/2$^-$	0.0	5/2$^-$	38 *3*
[x]1779.2 *3*	7.8					
1804.5 *5*	2.1	1891.3	3/2$^-$	86.76	1/2$^-$	46 *3*
1891.8 *5*	2.1	1891.3	3/2$^-$	0.0	5/2$^-$	12 *3*

[†] Branching ratio from 1978Pa15.
[‡] Placed γ′s are from 1978Pa15, unplaced γ′s are from 1973Is02.
[#] Relative intensity, mostly from 1973Is02 measured at E(p)=5.0 MeV, supplemented by branching ratio data from 1978Pa15. These data are in reasonable agreement with those of 1973Is02.
[@] From γ(θ) and J^π of initial and final levels (1978Pa15), except where indicated otherwise.
[&] From γ(θ) and RUL.
[a] From γ(θ) (1978Pa15).
[b] From α(exp) data of 1973Is02. The authors normalized their data their data to α_k(exp)=0.082 for the 174.9γ E2 transition in ^{71}Ge. Renormalization to α_k(theory)=0.0811 from 2008Ki07 would not affect the conclusions.
[c] 1973Is02 report Iγ=74 for the doubly placed 812 γ. From branching in Adopted Gammas, one expects Iγ=62 for placement from the 812 level, leaving Iγ=12 for placement from the 1210 level. From Adopted Gammas, the 397.9 and 1210 γ′s have a branching of ≈ 10 % that of the 812 γ.
[d] The 778.62 γ and 1192.7 γ are unplaced by 1973Is02. The authors′ ratio of Iγ(1192γ)/Iγ(779γ)=1.35 is inconsistent with 0.32 5 from 1978Pa15 and 0.52 *10* from (α,nγ).
[e] Additional information 1.
[f] Multiply placed with intensity suitably divided.
[g] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

$^{69}_{32}Ge_{37}$-11

^{69}Ga(p,nγ) 1978Pa15,1973Is02

Level Scheme

Intensities: Relative I_γ

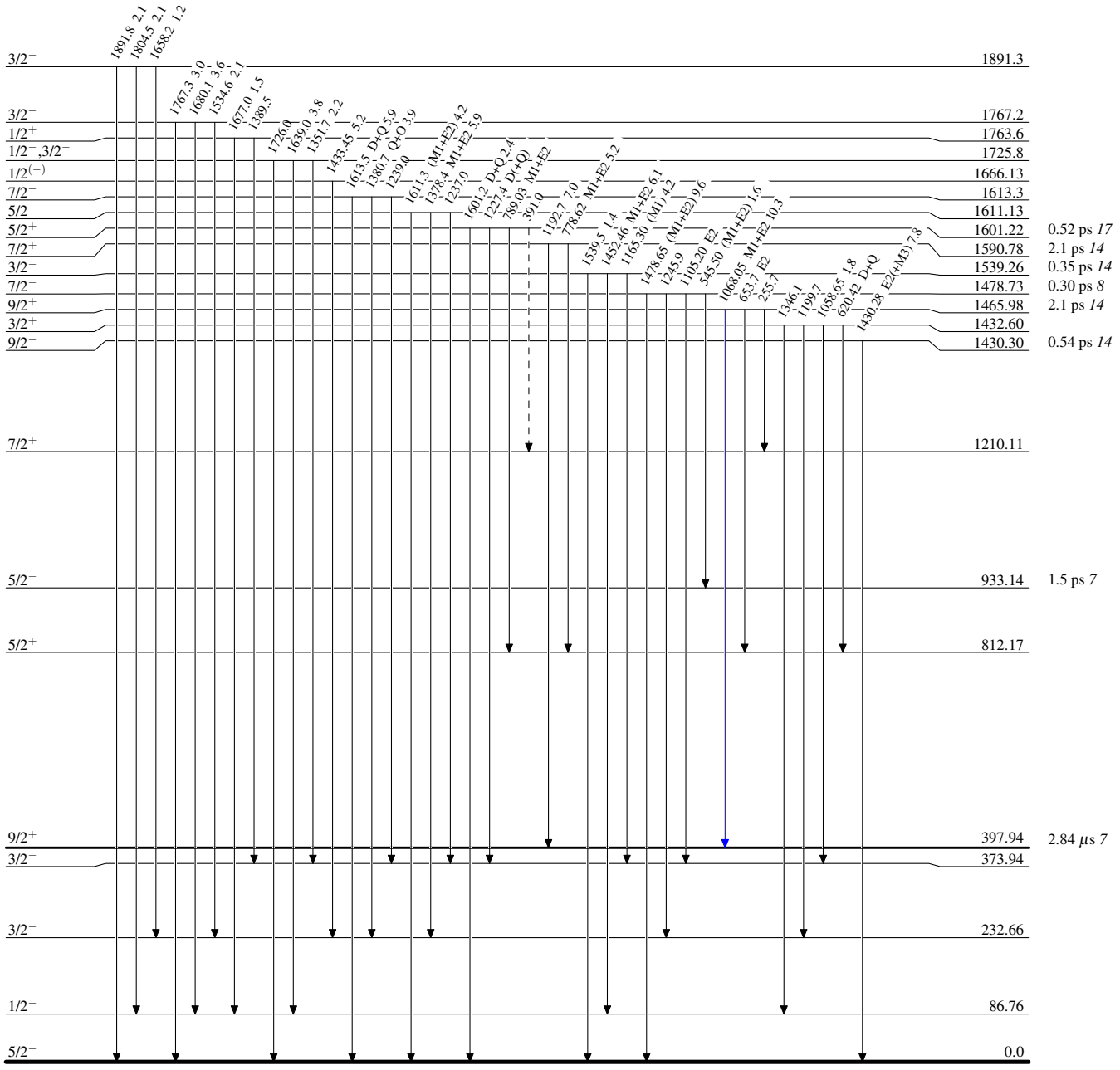
Legend

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

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

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

γ Decay (Uncertain)



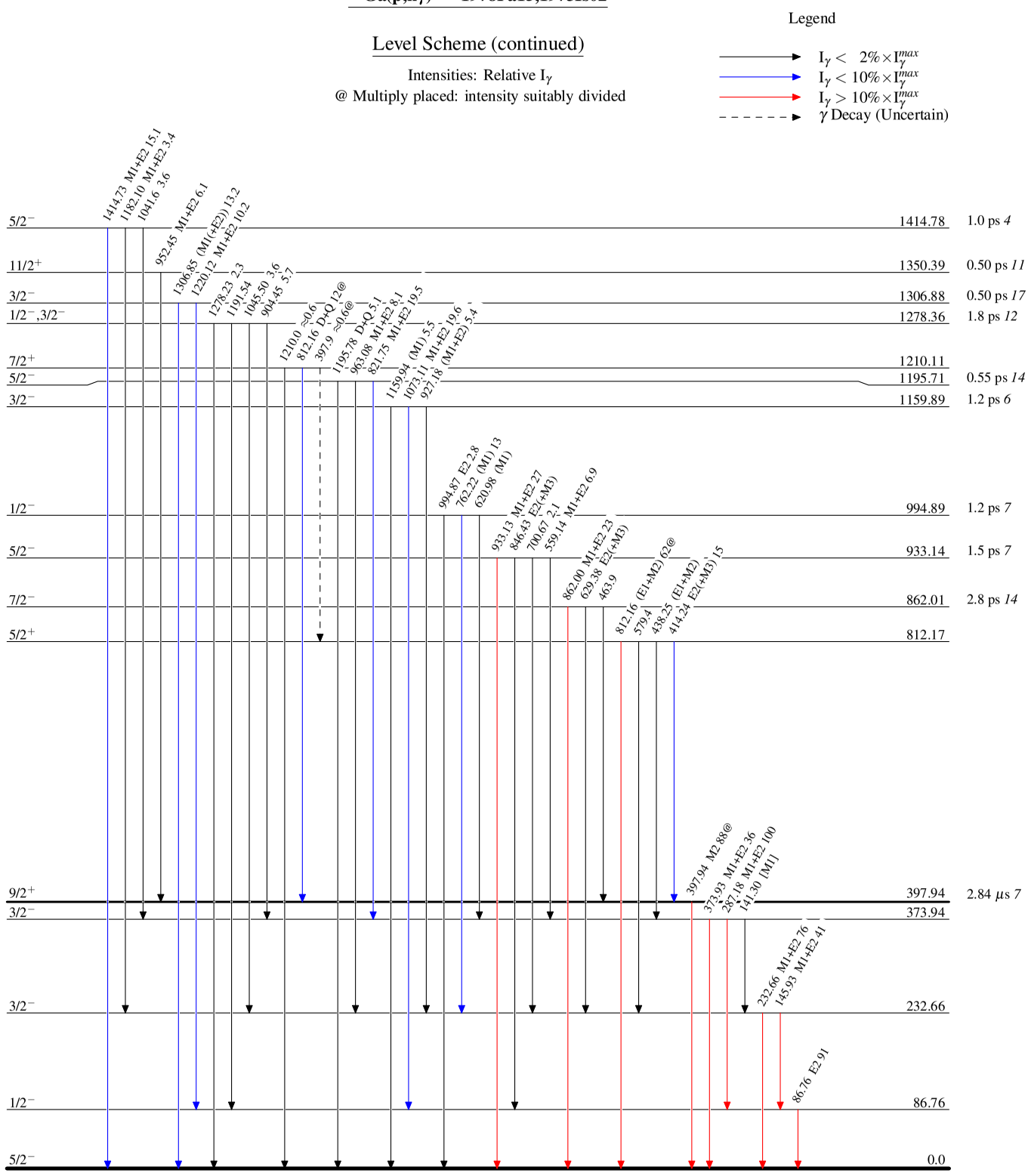
$^{69}_{32}Ge_{37}$

^{69}Ga(p,nγ) 1978Pa15,1973Is02

Level Scheme (continued)

Intensities: Relative I_γ

@ Multiply placed: intensity suitably divided



$^{69}_{32}Ge_{37}$