^{74}Ge(α,α3nγ) 2022Wa21

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 188,1 (2023)	17-Jan-2023

2022Wa21: E(α)=58.6 and 62.6 MeV. Target=2.85 mg/cm^2 ^{74}Ge with a 10.8 mg/cm^2 backing. Measured Eγ, Iγ, $\gamma\gamma$-coin, $\gamma\gamma(\theta)$(ADO), $\gamma\gamma$(linear pol) using the AFRODITE array with eight Compton-suppressed clover detectors and two low-energy photon spectrometers (LEPS detectors) at the Separated Sector Cyclotron facility of iThemba LABS. Deduced high-spin levels, J^π, bands, evidence for an octupole band from B(E1)/B(E2) ratios.

Detailed numerical data for Eγ, Iγ, $\gamma\gamma$-coin, $\gamma\gamma(\theta)$(ADO), $\gamma\gamma$(linear polarization) were provided by the corresponding authors of 2022Wa21 on Sept 06, 2022, in response to evaluators' request.

^{71}Ge Levels

E(level)†	Jπ	E(level)†	Jπ	E(level)†	Jπ	E(level)†	Jπ
0.0	1/2−	1421.94& 13	9/2−	3097.17b 31	17/2+	4472.5c 5	23/2−
174.9 1	5/2−	1476.4a 4	11/2+	3272.26d 19	17/2−	4914.5# 8	23/2+
198.18‡ 35	9/2+	1949.30@ 16	11/2−	3325.06& 34	17/2−	5009.0‡ 5	25/2+
499.88@ 25	3/2−	1959.1b 4	13/2+	3411.29c 30	19/2−	5274.0d 6	25/2−
589.5a 4	7/2+	2298.6‡ 4	17/2+	3592.7‡ 4	21/2+	5727.0c 6	27/2−
747.09& 23	5/2−	2313.6# 4	15/2+	3599.2# 5	19/2+	6639.3‡ 8	29/2+
1037.3b 4	9/2+	2348.85& 16	13/2−	3757.2@ 10	(19/2−)	7113.8c 9	31/2−
1096.10@ 13	7/2−	2698.4a 7	15/2+	4013.3?a 10	(19/2+)		
1172.28‡ 34	13/2+	2836.94c 32	15/2−	4098.49d 30	21/2−		
1192.00# 35	11/2+	2890.23@ 29	15/2−	4363.0?& 10	(21/2−)		

† From least-squares fit to Eγ data.
‡ Band(A): Band based on 198, 9/2$^+$,α=+1/2.
# Band(a): Band based on 11/2$^+$,α=−1/2.
@ Band(B): Band based on 3/2$^-$,α=−1/2.
& Band(b): Band based on 5/2$^-$,α=+1/2.
a Band(C): Band based on 7/2$^+$,α=−1/2.
b Band(c): Band based on 1038, 9/2$^+$,α=+1/2.
c Band(D): Octupole band based on 15/2$^-$,α=−1/2.
d Band(d): Octupole band based on 17/2$^-$,α=+1/2.

$\gamma(^{71}Ge)$

The $\gamma\gamma(\theta)$(ADO) ratios are for Iγ(135°)/Iγ(90°), with typical ratios of ≈1.2 for stretched quadrupole and ≈0.8 for stretched dipole transitions.

E$_\gamma$†	I$_\gamma$	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Mult.‡	Comments
139.1 6	1.0 2	3411.29	19/2−	3272.26	17/2−	(D)	R_{ADO}=0.89 28.
174.9 1	75 11	174.9	5/2−	0.0	1/2−	(Q)	R_{ADO}=1.13 23.
247.3 6	4.1 7	747.09	5/2−	499.88	3/2−	(D)	R_{ADO}=0.93 15.
314.1 1	16.7 26	3411.29	19/2−	3097.17	17/2+	E1	R_{ADO}=0.78 12; POL=+0.21 8.
326.1 6	2.0 3	1421.94	9/2−	1096.10	7/2−	D	R_{ADO}=0.81 16.
349.0 6	1.2 2	1096.10	7/2−	747.09	5/2−	D	R_{ADO}=0.82 15.
373.9 6	3.9 6	4472.5	23/2−	4098.49	21/2−	D	R_{ADO}=0.83 12.
391.3 1	15.6 25	589.5	7/2+	198.18	9/2+	M1	R_{ADO}=0.95 15; POL=−0.33 8.
399.4 6	1.5 3	2348.85	13/2−	1949.30	11/2−	D	R_{ADO}=0.53 8.

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^{74}Ge(α,α3nγ) 2022Wa21 (continued)

$\gamma(^{71}Ge)$ (continued)

E_γ[†]	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	Comments
435.3 *6*	1.3 *2*	3272.26	17/2$^-$	2836.94	15/2$^-$	D	R_{ADO}=0.72 *11*.
447.9 *3*	5.4 *8*	1037.3	9/2$^+$	589.5	7/2$^+$	M1+E2	R_{ADO}=1.04 *14*; POL=−0.35 *14*.
453.0 *6*	1.5 *3*	5727.0	27/2$^-$	5274.0	25/2$^-$	D	R_{ADO}=0.52 *7*.
482.6 *6*	4.3 *6*	1959.1	13/2$^+$	1476.4	11/2$^+$	D	R_{ADO}=0.90 *11*.
499.9 *3*	7.6 *10*	499.88	3/2$^-$	0.0	1/2$^-$		R_{ADO}=1.15 *13*.
521.1 *6*	3.1 *6*	3411.29	19/2$^-$	2890.23	15/2$^-$	(Q)	R_{ADO}=1.65 *18*.
527.2 *6*	1.7 *3*	1949.30	11/2$^-$	1421.94	9/2$^-$	D	R_{ADO}=0.58 *5*.
541.1 *6*	1.2 *2*	2890.23	15/2$^-$	2348.85	13/2$^-$	D	R_{ADO}=0.56 *6*.
572.1 *6*	3.5 *6*	747.09	5/2$^-$	174.9	5/2$^-$	D	R_{ADO}=1.09 *10*; ΔJ=0 transition.
574.4 *3*	9.4 *13*	3411.29	19/2$^-$	2836.94	15/2$^-$	E2	R_{ADO}=1.50 *13*; POL=+0.41 *9*.
596.2 *6*	4.1 *7*	1096.10	7/2$^-$	499.88	3/2$^-$	Q	R_{ADO}=1.40 *12*.
674.9 *3*	8.1 *10*	1421.94	9/2$^-$	747.09	5/2$^-$	Q	R_{ADO}=1.25 *9*.
687.2 *3*	5.6 *4*	4098.49	21/2$^-$	3411.29	19/2$^-$	M1	R_{ADO}=0.81 *6*; POL=−0.33 *11*.
747.3 *6*	2.1 *4*	747.09	5/2$^-$	0.0	1/2$^-$	Q	R_{ADO}=1.25 *8*.
767.1 *3*	5.8 *10*	1959.1	13/2$^+$	1192.00	11/2$^+$	D+Q	R_{ADO}=1.36 *9*.
783.4 *3*	13.2 *15*	3097.17	17/2$^+$	2313.6	15/2$^+$	M1	R_{ADO}=0.85 *5*; POL=−0.41 *9*.
786.9 *6*	4.1 *6*	1959.1	13/2$^+$	1172.28	13/2$^+$	D+Q	R_{ADO}=0.73 *6*; ΔJ=0 transition.
798.8 *6*	1.5 *3*	3097.17	17/2$^+$	2298.6	17/2$^+$	D	R_{ADO}=1.07 *10*; ΔJ=0 transition.
826.2 *3*	9.0 *10*	4098.49	21/2$^-$	3272.26	17/2$^-$	E2	R_{ADO}=1.43 *12*; POL=+0.52 *12*.
839.0 *3*	10.5 *20*	1037.3	9/2$^+$	198.18	9/2$^+$	D	R_{ADO}=1.22 *7*; ΔJ=0 transition.
853.2 *1*	17.5 *25*	1949.30	11/2$^-$	1096.10	7/2$^-$	E2	R_{ADO}=1.29 *6*; POL=+0.49 *12*.
867.0		3757.2	(19/2$^-$)	2890.23	15/2$^-$		
877.8 *6*	3.0 *6*	2836.94	15/2$^-$	1959.1	13/2$^+$	D	R_{ADO}=0.68 *17*.
887.0 *3*	8.4 *15*	1476.4	11/2$^+$	589.5	7/2$^+$	E2	R_{ADO}=1.20 *7*; POL=+0.23 *14*.
887.6 *6*	2.2 *4*	2836.94	15/2$^-$	1949.30	11/2$^-$	Q	R_{ADO}=1.43 *9*.
921.2 *1*	19.7 *26*	1096.10	7/2$^-$	174.9	5/2$^-$	M1	R_{ADO}=0.67 *3*; POL=−0.32 *9*.
921.8 *6*	1.5 *3*	1959.1	13/2$^+$	1037.3	9/2$^+$	Q	R_{ADO}=1.27 *10*.
923.4 *1*	21.8 *26*	3272.26	17/2$^-$	2348.85	13/2$^-$	E2	R_{ADO}=1.28 *9*; POL=+0.43 *9*.
926.9 *1*	39.8 *52*	2348.85	13/2$^-$	1421.94	9/2$^-$	E2	R_{ADO}=1.27 *9*; POL=+0.33 *13*.
941.0 *3*	9.6 *11*	2890.23	15/2$^-$	1949.30	11/2$^-$	E2	R_{ADO}=1.18 *6*; POL=+0.38 *12*.
974.1 *1*	100.0	1172.28	13/2$^+$	198.18	9/2$^+$	E2	R_{ADO}=1.31 *7*; POL=+0.53 *16*.
976.2 *3*	6.4 *9*	3325.06	17/2$^-$	2348.85	13/2$^-$	E2	R_{ADO}=1.12 *12*; POL=+0.44 *18*.
993.8 *1*	53.2 *56*	1192.00	11/2$^+$	198.18	9/2$^+$	M1+E2	R_{ADO}=1.34 *7*; POL=−0.21 *13*.
1037.9[#]		4363.0?	(21/2$^-$)	3325.06	17/2$^-$		
1061.3 *6*	1.5 *4*	4472.5	23/2$^-$	3411.29	19/2$^-$	Q	R_{ADO}=1.19 *14*.
1113.1 *6*	3.0 *5*	3411.29	19/2$^-$	2298.6	17/2$^+$	D	R_{ADO}=0.57 *10*.
1121.6 *1*	26.4 *32*	2313.6	15/2$^+$	1192.00	11/2$^+$	E2	R_{ADO}=1.16 *6*; POL=+0.42 *16*.
1126.3 *1*	45.1 *62*	2298.6	17/2$^+$	1172.28	13/2$^+$	E2	R_{ADO}=1.22 *6*; POL=+0.52 *9*.
1138.1 *3*	13.2 *14*	3097.17	17/2$^+$	1959.1	13/2$^+$	E2	R_{ADO}=1.23 *9*; POL=+0.33 *22*.
1141.3 *6*	2.4 *4*	2313.6	15/2$^+$	1172.28	13/2$^+$	D+Q	R_{ADO}=1.14 *7*.
1175.6 *6*	1.5 *3*	5274.0	25/2$^-$	4098.49	21/2$^-$	Q	R_{ADO}=1.36 *11*.
1222.0 *6*	2.4 *4*	2698.4	15/2$^+$	1476.4	11/2$^+$	(Q)	R_{ADO}=1.52 *12*.
1247.0 *1*	51.7 *60*	1421.94	9/2$^-$	174.9	5/2$^-$	E2	R_{ADO}=1.30 *8*; POL=+0.42 *13*.
1254.4 *6*	2.8 *5*	5727.0	27/2$^-$	4472.5	23/2$^-$	Q	R_{ADO}=1.31 *9*.
1278.1 *3*	8.9 *15*	1476.4	11/2$^+$	198.18	9/2$^+$	D	R_{ADO}=1.01 *11*.
1285.6 *3*	8.2 *10*	3599.2	19/2$^+$	2313.6	15/2$^+$	Q	R_{ADO}=1.26 *8*.
1294.1 *1*	22.7 *15*	3592.7	21/2$^+$	2298.6	17/2$^+$	E2	R_{ADO}=1.31 *7*; POL=+0.32 *14*.
1314.9[#]		4013.3?	(19/2$^+$)	2698.4	15/2$^+$		
1315.2 *6*	1.9 *3*	4914.5	23/2$^+$	3599.2	19/2$^+$	Q	R_{ADO}=1.21 *9*.
1386.8 *6*	1.5 *3*	7113.8	31/2$^-$	5727.0	27/2$^-$	Q	R_{ADO}=1.16 *9*.
1416.3 *3*	7.3 *7*	5009.0	25/2$^+$	3592.7	21/2$^+$	Q	R_{ADO}=1.40 *10*.
1630.3 *6*	1.3 *2*	6639.3	29/2$^+$	5009.0	25/2$^+$	Q	R_{ADO}=1.49 *17*.
1664.7 *3*	12.7 *17*	2836.94	15/2$^-$	1172.28	13/2$^+$	E1	R_{ADO}=0.79 *7*; POL=+0.34 *16*.
1760.9 *6*	2.1 *4*	1959.1	13/2$^+$	198.18	9/2$^+$	Q	R_{ADO}=1.18 *13*.
1924.5 *6*	0.4 *1*	3097.17	17/2$^+$	1172.28	13/2$^+$		

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^{74}Ge(α,α3nγ) 2022Wa21 (continued)

$\gamma(^{71}Ge)$ (continued)

† Uncertainties are stated as 0.1-0.6 keV by authors in their Sept 06, 2022 communication. Evaluators assign 0.1 keV for Eγ values with I$\gamma\geq$15, 0.3 keV for Iγ=5-15, and 0.6 keV for I$\gamma\leq$5.
‡ Assigned by evaluators from R_{ADO} and linear polarization in 2022Wa21. Mult=Q is most likely E2.
# Placement of transition in the level scheme is uncertain.

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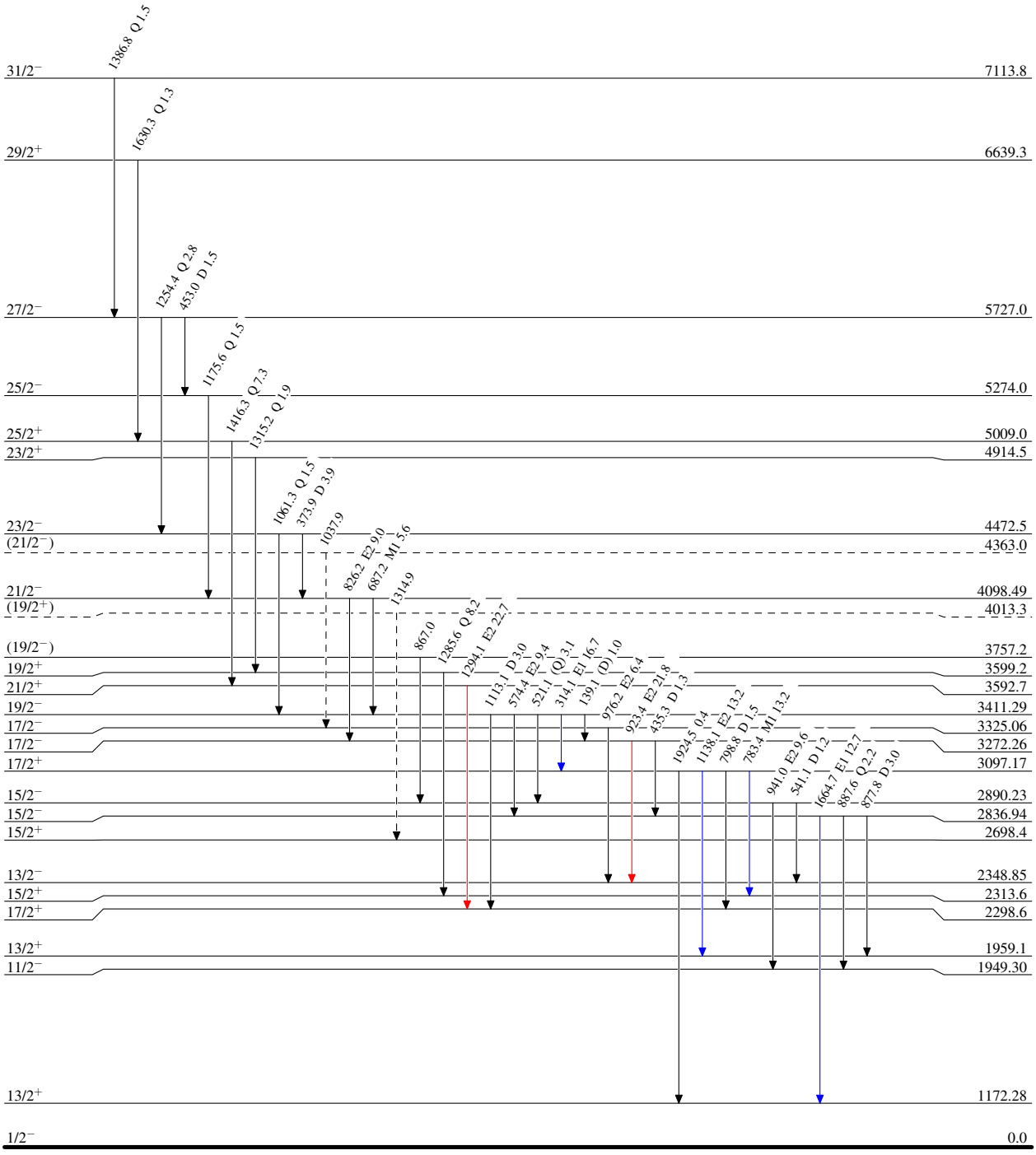
Level Scheme

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)

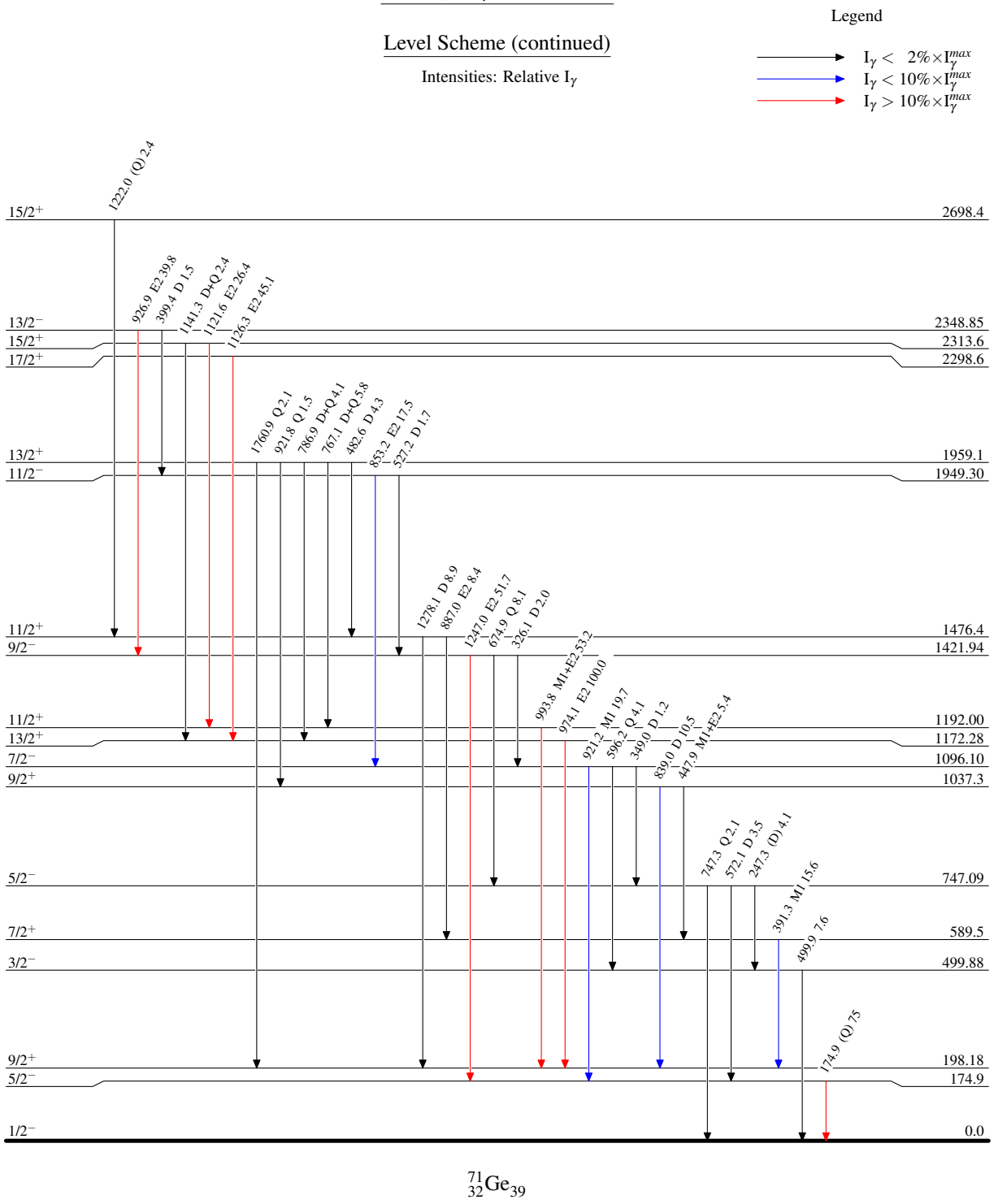


$^{71}_{32}Ge_{39}$

^{74}Ge(α,α3nγ) 2022Wa21

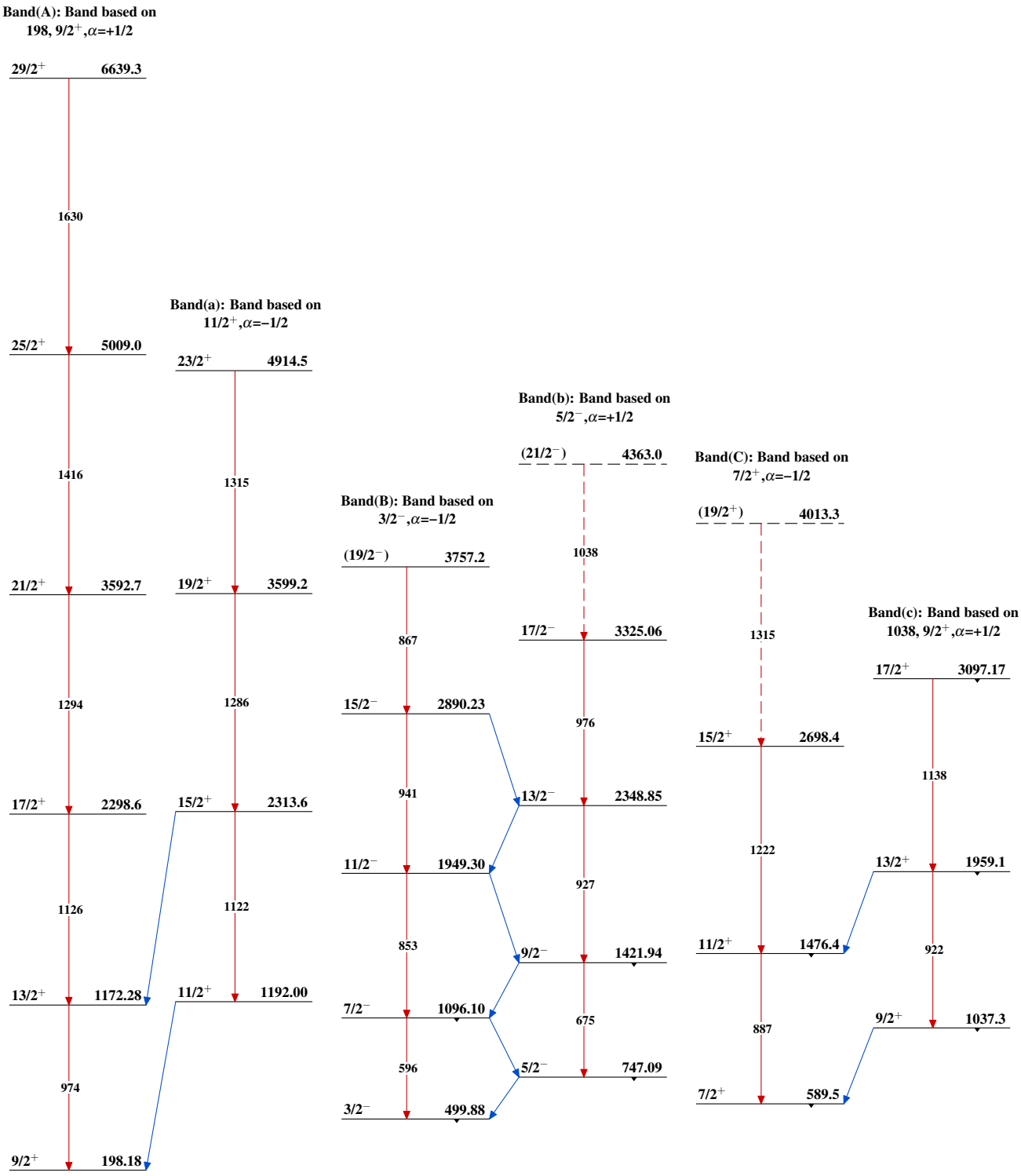
Level Scheme (continued)

Intensities: Relative I_γ



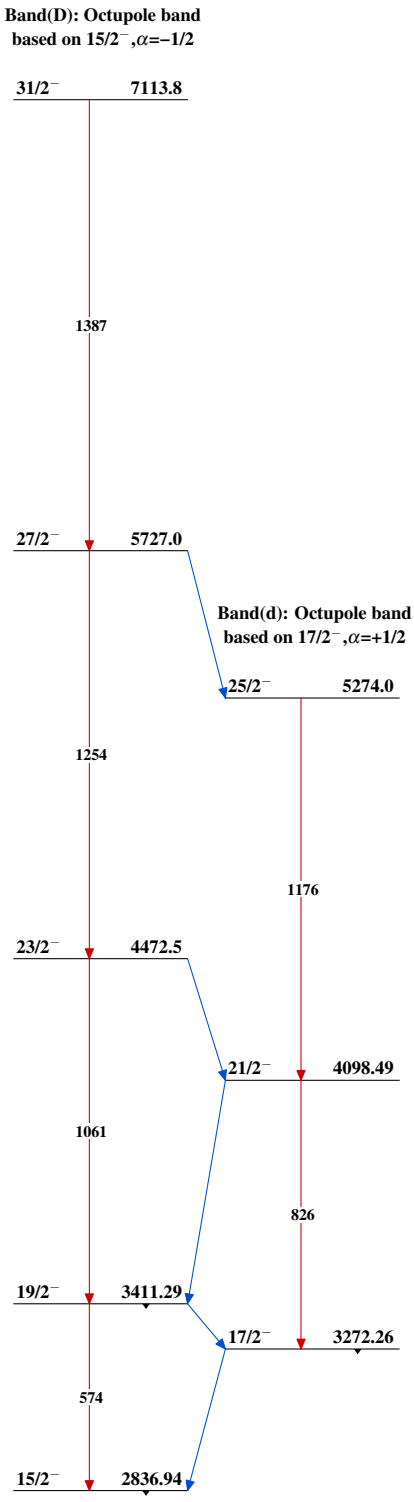
$^{71}_{32}Ge_{39}$

^{74}Ge(α,α3nγ) 2022Wa21



$^{71}_{32}Ge_{39}$

^{74}Ge(α,α3nγ) 2022Wa21 (continued)



$^{71}_{32}Ge_{39}$