

$^{74}\text{Ge}(n,\gamma)$ E=thermal 2012Me04,2011Ha56

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Alexandru Negret, Balraj Singh		NDS 114, 841 (2013)	30-Jun-2013

2012Me04 (also **2010Me01**): $E(n)$ (average)=0.00183 eV, cold neutrons from reactor at PGAA research reactor facility in Garching. Measured E_γ , I_γ , $\gamma\gamma$ coin using two Compton suppressed HPGe detectors. Sample was enriched to 39.2% in ^{74}Ge . **2010Me01** and **2009Me06** from the same group, who reported capture cross sections for the isomeric state and g.s.

2011Ha56: cold neutrons from JRR-3 reactor at JAEA facility. Measured E_γ , I_γ , $\gamma\gamma$ coin using STELLA array of eight clover Ge detectors with BGO Compton suppressors. Full details of this study are not yet available.

Other γ -ray studies:

1972Gr34, **1972Ha74**, **1972We10**: measured E_γ , absolute I_γ , $S(n)$.

1991Is01: measured E_γ , absolute I_γ (only primary transitions were reported), deduced $S(n)$.

Cross section and other measurements:

2009Ma35: measured σ in (n,γ) by activation; $E(n)=25$ keV.

2007ChZX: PGAA database. In the elemental cross section measurements, 8 primary γ rays and 13 secondary gamma rays were assigned to ^{75}Ge .

1987Ko23: measured coherent scattering lengths, σ .

1987Li05: non statistical effects in (n,γ) ; calculated $\sigma(E)$.

1979An22: measured σ in (n,γ) ; $E(n)=25$ keV.

Additional information 1.

1972La15: measured isomeric cross-section ratios in (n,γ) at $E(n)=25.5$ keV.

1970Di03: $\sigma(n,\gamma)$ at $E(n)=3$ MeV.

1969Pr08, **1968Ma12**, **1967Ok01** (isomer cross section).

 ^{75}Ge Levels

E(level) [†]	J^π [‡]	$T_{1/2}$ [‡]	Comments
0	$1/2^-$		
139.81 7	$7/2^+$	47.7 s 5	%IT=99.970 6; % β^- =0.030 6
192.28 8	$5/2^+$	216 ns 5	
253.14 6	$3/2^-$		
317.12 6	$5/2^-$		
457.26 7	$5/2^-$		
574.92 6	$3/2^-$		
583.31 13	$5/2^+$		
673.98 10	$1/2^+$		
762.18 10	$(3/2)$		
885.81 8	$1/2^-$		
901.59 22			
1137.22 6	$3/2^-$		
1240.92 13	$(5/2)^-$		
1416.43 8	$1/2^-, 3/2^-$		
1428.66 8	$(1/2, 3/2)$		
1502.31 7	$1/2^-, 3/2^-$		
1514.78 8	$1/2^+$		
1688.23 10	$(1/2, 3/2, 5/2)^+$		
1757.6 10	$(1/2, 3/2, 5/2^+)$		
1798.23 6	$1/2^-, 3/2^-$		
1868.61 21	$3/2^+$		
2004.07 13	$3/2^+$		
2065.58 10			
2091.16 10			
2311.73 17			
2494.0 7			
2544.5 7			

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$^{74}\text{Ge}(n,\gamma)$ E=thermal [2012Me04,2011Ha56](#) (continued) ^{75}Ge Levels (continued)

E(level) [†]	J ^π [‡]	Comments
2570.4 7		
2660.7 7		
2679.7 7		
2744.3 7		
2757.4 7		
2784.0 7		
2840.1 7		
2866.1 7		
2897.5 7		
2928.4 7		
2952.6 7		
2964.5 7		
2995.0 7		
3004.3 7		
3170.5 7		
3202.1 7		
3226.6 7		
(6505.80 5)	1/2 ⁺	E(level): S(n)=6505.84 5 (2012Wa38). J ^π : s-wave capture in ^{74}Ge g.s.

[†] From least-squares fit to E_γ data, assuming 1 keV uncertainty when not given. The 444.95-keV doublet was not included in the fitting procedure. Uncertainties of 444.9 and 236.25 were increased to 0.3 keV for an acceptable fit. Reduced $\chi^2=1.1$ with these adjustments.

[‡] From Adopted Levels.

 $\gamma(^{75}\text{Ge})$

I_γ normalization: from [2012Me04](#).

E _γ [†]	I _γ ^{†@}	E _i (level)	J _i ^π	E _f	J _f ^π	Mult.	α ^{&}	Comments
52.5 1	10.8 6	192.28	5/2 ⁺	139.81	7/2 ⁺			E _γ : from Adopted Gammas. Additional information 3 . E _γ : from 1972We10 . I _γ : normalized to I _γ of 177γ. α(K)=1.277 19; α(L)=0.214 3; α(M)=0.0316 5; α(N)=0.001381 20
124.7 2	2.59	317.12	5/2 ⁻	192.28	5/2 ⁺			
139.81 10	35.8 10	139.81	7/2 ⁺	0	1/2 ⁻	E3	1.524	Mult.: from Adopted Gammas. Additional information 4 . α: α(K)exp=0.26 24 (1972We10).
177.29 11	20.2 7	317.12	5/2 ⁻	139.81	7/2 ⁺			E _γ : level-energy difference=235.63. Additional information 2 . E _γ : from 1972Ha74 . I _γ : normalized to I _γ 885.83γ.
204.09 10	9.5 4	457.26	5/2 ⁻	253.14	3/2 ⁻			
236.25 11	0.98 6	1137.22	3/2 ⁻	901.59				
253.01 10	100	253.14	3/2 ⁻	0	1/2 ⁻			
299.7 15	2.56	885.81	1/2 ⁻	583.31	5/2 ⁺			Additional information 5 .
310.89 10	4.02 18	885.81	1/2 ⁻	574.92	3/2 ⁻			
317.14 10	6.14 25	317.12	5/2 ⁻	0	1/2 ⁻			
321.89 21	3.4 5	574.92	3/2 ⁻	253.14	3/2 ⁻			
443.48 [‡] 11	1.22 9	583.31	5/2 ⁺	139.81	7/2 ⁺			E _γ : level-energy difference=444.33.
444.95 ^{a‡} 10	16.0 ^a 6	762.18	(3/2)	317.12	5/2 ⁻			
444.95 ^{a‡} 10	16.0 ^a 6	901.59		457.26	5/2 ⁻			

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$^{74}\text{Ge}(n,\gamma)$ E=thermal **2012Me04,2011Ha56** (continued) $\gamma(^{75}\text{Ge})$ (continued)

E_γ †	I_γ †@	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Comments
457.24 10	12.0 4	457.26	5/2 ⁻	0	1/2 ⁻	Additional information 6.
481.71 10	15.0 4	673.98	1/2 ⁺	192.28	5/2 ⁺	
562.28 13	1.35 12	1137.22	3/2 ⁻	574.92	3/2 ⁻	
568.89 23	1.01 20	885.81	1/2 ⁻	317.12	5/2 ⁻	
570.02 20	4.1 8	762.18	(3/2)	192.28	5/2 ⁺	$\sigma=0.0052$ 8 (2007ChZX).
574.98 10	49.5 17	574.92	3/2 ⁻	0	1/2 ⁻	Additional information 7.
632.4 3	5.7 21	885.81	1/2 ⁻	253.14	3/2 ⁻	
^x 647.67 11	3.14 13					In coin with 253 γ .
673.96 15	4.4 3	673.98	1/2 ⁺	0	1/2 ⁻	$\sigma=0.0040$ 6 (2007ChZX). $E_\gamma=673.9$ (2011Ha56).
679.89 12	2.10 13	1137.22	3/2 ⁻	457.26	5/2 ⁻	
762.51 22	3.6 4	762.18	(3/2)	0	1/2 ⁻	Additional information 8.
783.58 23	1.5 4	1240.92	(5/2) ⁻	457.26	5/2 ⁻	
820.13 10	5.08 18	1137.22	3/2 ⁻	317.12	5/2 ⁻	
840.7 5	1.36 15	1514.78	1/2 ⁺	673.98	1/2 ⁺	
841.4 4	5.8 24	1416.43	1/2 ⁻ , 3/2 ⁻	574.92	3/2 ⁻	
885.83 11	7.9 3	885.81	1/2 ⁻	0	1/2 ⁻	Additional information 9.
927.39 11	5.00 24	1502.31	1/2 ⁻ , 3/2 ⁻	574.92	3/2 ⁻	
987.80 14	0.99 9	1240.92	(5/2) ⁻	253.14	3/2 ⁻	
1045.3 3	2.1 7	1502.31	1/2 ⁻ , 3/2 ⁻	457.26	5/2 ⁻	
1137.15 11	4.1 3	1137.22	3/2 ⁻	0	1/2 ⁻	Additional information 10.
1175.54 11	3.27 24	1428.66	(1/2, 3/2)	253.14	3/2 ⁻	
1223.33 10	11.5 4	1798.23	1/2 ⁻ , 3/2 ⁻	574.92	3/2 ⁻	
1249 1	3.2 14	1502.31	1/2 ⁻ , 3/2 ⁻	253.14	3/2 ⁻	
1285.29 16	1.18 14	1868.61	3/2 ⁺	583.31	5/2 ⁺	
1416.45 11	5.97 21	1416.43	1/2 ⁻ , 3/2 ⁻	0	1/2 ⁻	Additional information 11.
1428.67 12	1.07 6	1428.66	(1/2, 3/2)	0	1/2 ⁻	Additional information 12.
1495.98 11	4.63 19	1688.23	(1/2, 3/2, 5/2) ⁺	192.28	5/2 ⁺	
1502.34 11	2.37 13	1502.31	1/2 ⁻ , 3/2 ⁻	0	1/2 ⁻	Additional information 13.
1514.85 11	7.6 3	1514.78	1/2 ⁺	0	1/2 ⁻	Additional information 14.
1545.06 11	6.79 24	1798.23	1/2 ⁻ , 3/2 ⁻	253.14	3/2 ⁻	Additional information 15.
1606.8 4	0.96 17	2065.58		457.26	5/2 ⁻	E_γ : poor fit, level-energy difference=1608.3.
1757.6 [#]		1757.6	(1/2, 3/2, 5/2 ⁺)	0	1/2 ⁻	
1798.30 11	4.48 16	1798.23	1/2 ⁻ , 3/2 ⁻	0	1/2 ⁻	Additional information 16.
1873.27 15	6.6 7	2065.58		192.28	5/2 ⁺	
2065.2 [#]		2065.58		0	1/2 ⁻	
2091.21 15	4.6 9	2091.16		0	1/2 ⁻	Additional information 17.
2119.42 16	5.4 10	2311.73		192.28	5/2 ⁺	
2311.5 [#]		2311.73		0	1/2 ⁻	
2493.3 [#]		2494.0		0	1/2 ⁻	
2543.7 [#]		2544.5		0	1/2 ⁻	
2569.7 [#]		2570.4		0	1/2 ⁻	
2659.9 [#]		2660.7		0	1/2 ⁻	
2679.0 [#]		2679.7		0	1/2 ⁻	
2743.3 [#]		2744.3		0	1/2 ⁻	
2756.6 [#]		2757.4		0	1/2 ⁻	
2783.1 [#]		2784.0		0	1/2 ⁻	
2839.2 [#]		2840.1		0	1/2 ⁻	
2865.2 [#]		2866.1		0	1/2 ⁻	
2896.7 [#]		2897.5		0	1/2 ⁻	
2927.7 [#]		2928.4		0	1/2 ⁻	
2951.6 [#]		2952.6		0	1/2 ⁻	

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$^{74}\text{Ge}(\text{n},\gamma)$ E=thermal **2012Me04,2011Ha56** (continued) $\gamma(^{75}\text{Ge})$ (continued)

$E_\gamma^\dagger$	$I_\gamma^\dagger@$	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Comments
2963.7 [#]		2964.5		0	1/2 ⁻	
2994.2 [#]		2995.0		0	1/2 ⁻	
3003.0 [#]		3004.3		0	1/2 ⁻	
3169.8 [#]		3170.5		0	1/2 ⁻	
3201.3 [#]		3202.1		0	1/2 ⁻	
3225.6 [#]		3226.6		0	1/2 ⁻	
3278.1 [#]		(6505.80)	1/2 ⁺	3226.6		
3302.9 [#]		(6505.80)	1/2 ⁺	3202.1		
3334.6 [#]		(6505.80)	1/2 ⁺	3170.5		
3500.2 [#]		(6505.80)	1/2 ⁺	3004.3		
3509.9 [#]		(6505.80)	1/2 ⁺	2995.0		
3540.5 [#]		(6505.80)	1/2 ⁺	2964.5		
3552.2 [#]		(6505.80)	1/2 ⁺	2952.6		
3576.7 [#]		(6505.80)	1/2 ⁺	2928.4		
3607.4 [#]		(6505.80)	1/2 ⁺	2897.5		
3638.8 [#]		(6505.80)	1/2 ⁺	2866.1		
3664.8 [#]		(6505.80)	1/2 ⁺	2840.1		
3720.8 [#]		(6505.80)	1/2 ⁺	2784.0		
3747.5 [#]		(6505.80)	1/2 ⁺	2757.4		
3760.5 [#]		(6505.80)	1/2 ⁺	2744.3		
3825.3 [#]		(6505.80)	1/2 ⁺	2679.7		
3844.3 [#]		(6505.80)	1/2 ⁺	2660.7		
3934.6 [#]		(6505.80)	1/2 ⁺	2570.4		
3960.5 [#]		(6505.80)	1/2 ⁺	2544.5		
4011.1 [#]		(6505.80)	1/2 ⁺	2494.0		
4193.9 5	4.1 18	(6505.80)	1/2 ⁺	2311.73		Additional information 18.
4414.54 11	7.7 3	(6505.80)	1/2 ⁺	2091.16		Additional information 19.
4439.95 11	10.3 4	(6505.80)	1/2 ⁺	2065.58		Additional information 20.
4501.58 12	2.37 11	(6505.80)	1/2 ⁺	2004.07	3/2 ⁺	Additional information 21.
4707.51 10	25.8 10	(6505.80)	1/2 ⁺	1798.23	1/2 ⁻ , 3/2 ⁻	Additional information 22.
4747.80 11	3.63 15	(6505.80)	1/2 ⁺	1757.6	(1/2, 3/2, 5/2 ⁺)	Additional information 23.
						E_γ : placement from 2011Ha56.
4817.46 14	3.3 3	(6505.80)	1/2 ⁺	1688.23	(1/2, 3/2, 5/2 ⁺) ⁺	Additional information 24.
4990.92 11	7.9 3	(6505.80)	1/2 ⁺	1514.78	1/2 ⁺	Additional information 25.
5003.38 11	9.4 4	(6505.80)	1/2 ⁺	1502.31	1/2 ⁻ , 3/2 ⁻	Additional information 26.
5077.00 11	3.09 15	(6505.80)	1/2 ⁺	1428.66	(1/2, 3/2)	Additional information 27.
5089.21 11	14.5 6	(6505.80)	1/2 ⁺	1416.43	1/2 ⁻ , 3/2 ⁻	Additional information 28.
5368.38 16	7.8 11	(6505.80)	1/2 ⁺	1137.22	3/2 ⁻	Additional information 29.
5620.0 3	6.2 6	(6505.80)	1/2 ⁺	885.81	1/2 ⁻	Additional information 30.
5743.2 4	3.4 6	(6505.80)	1/2 ⁺	762.18	(3/2)	Additional information 31.
5831.6 3	1.73 11	(6505.80)	1/2 ⁺	673.98	1/2 ⁺	Additional information 32.
5930.68 11	8.6 4	(6505.80)	1/2 ⁺	574.92	3/2 ⁻	Additional information 33.
6252.24 11	36.4 13	(6505.80)	1/2 ⁺	253.14	3/2 ⁻	Additional information 34.
6505.40 11	9.5 4	(6505.80)	1/2 ⁺	0	1/2 ⁻	Additional information 35.

[†] From **2012Me04**, unless stated otherwise. Systematic uncertainty of 0.10 keV is included in the uncertainty quoted by **2012Me04**.[‡] Correct energy, intensity and placement unclear (**2012Me04**).

$^{74}\text{Ge}(\text{n},\gamma)$ E=thermal [2012Me04,2011Ha56](#) (continued)

$\gamma(^{75}\text{Ge})$ (continued)

From [2011Ha56](#) only.

@ For intensity per 100 neutron captures, multiply by 0.32 4.

& 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.

^a Multiply placed with undivided intensity.

^x γ ray not placed in level scheme.



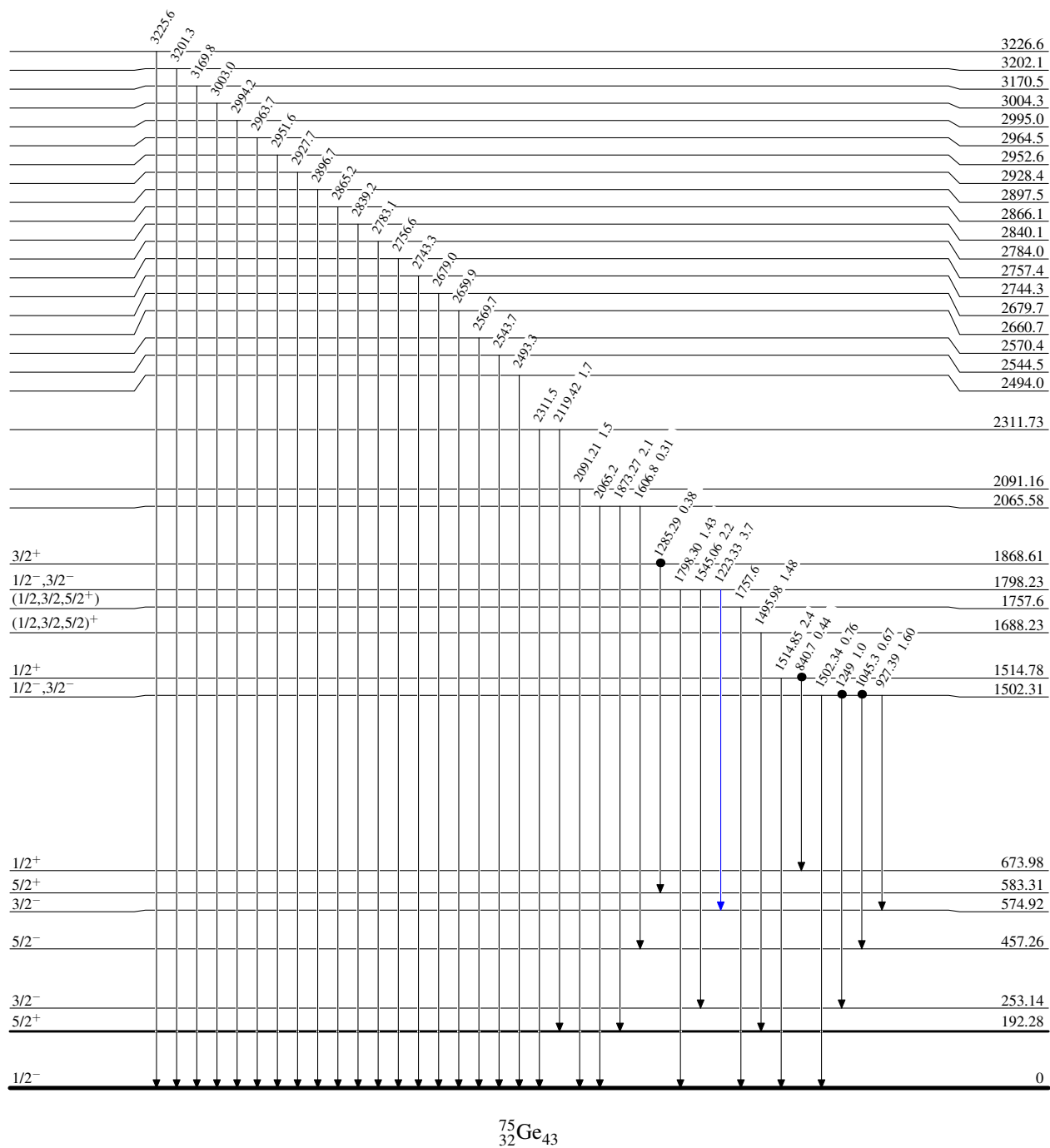
$^{74}\text{Ge}(n,\gamma)$ E=thermal 2012Me04,2011Ha56

Legend

Level Scheme (continued)

Intensities: Intensities per 100 neutron captures

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



$^{74}\text{Ge}(n,\gamma)$ E=thermal 2012Me04,2011Ha56

Level Scheme (continued)

Intensities: Intensities per 100 neutron captures
& Multiply placed: undivided intensity given

Legend

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

