^{44}Ca(pol n,γ),(n,γ) E=thermal

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	T. W. Burrows	NDS 109, 171 (2008)	30-Oct-2007

1968Gr11,1967Gr16 measured γ's.
1969Bo31 measured $\gamma\gamma$-coincidences.
1969Gr21 measured $\gamma\gamma(\theta)$; Ge(Li), NaI.
1971BiZH measured γ's; Ge(Li) with anti-coincidence NaI annulus (low-energy γ's), three crystal (NaI,Ge(Li)) pair spect (Eγ>3 MeV).
1978Ve06 measured circular polarization of γ's; N polarization=90% 5, two-Ge(Li) polarization spect.
2003ChZS: measured γ's; HPGe; natural target. Obtained Prompt Gamma-Ray Activation datasets for Ca using their data, ENSDF (1992Bu01 and unpublished updates), and 1981Lo16.
Others: 2002Re13. See also 1983Bu21.

^{45}Ca Levels

Strong correlations observed between relative reduced E1 strengths of primary transitions and spectroscopic factors for L=1 transitions to the same final states In (d,p). 1971BiZH reported a correlation coefficient of 0.92; 1968Gr11, 0.91. 1968Gr11 also noted that the correlation is considerably better for ^{45}Ca than for ^{41}Ca. However, it is difficult to conclude that the reaction mechanism for ^{45}Ca(n,γ) is dominated by direct capture since the capture cross section is relatively high. 1981MuZQ noted that there is a direct component contributing to the capture cross section. See also 1987Ka28, 1987Sh03, and 1989Ra06.
J(α),E(β) from the Adopted Levels. J$^\pi$(174)=(5/2,7/2$^+$) and J$^\pi$(3838,5000)=(1/2$^-$) from circular polarization (1978Ve06).

E(level)[†]	J$^\pi$[‡]	T$_{1/2}$[#]
0.0	7/2$^-$ [@]	
174.26 *6*	5/2$^-$ [@]	
1434.80 *7*	3/2$^-$ [@]	<17 ns
1878.30 *25*	3/2$^+$	
1884.4[&] *4*		
1899.98 *8*	3/2$^-$ [@]	
2249.13 *8*	1/2$^-$ [@]	
2392.5? *3*	1/2$^+$	
2675.1? *10*	(3/2,5/2)	
2842.08 *16*	3/2$^-$	
3241.28 *24*	3/2$^-$	
3418.48 *14*	1/2$^-$	
3783.22 *22*	1/2$^-$,3/2$^-$	
3837.9 *3*	(1/2)$^-$	
4467.59?[a] *20*	1/2$^-$,3/2$^-$	
4615.74 *15*	1/2$^-$	
4999.68 *20*	(1/2)$^-$	
5237?[a] *3*	1/2$^-$,3/2$^-$	
(7414.79[b] *17*)	1/2$^+$ [c]	

† Calculated by evaluator using least-squares adjustment procedures with the energy of the capture-state fixed.
‡ From circular polarization (1978Ve06), except As noted.
# From resolving time of coin system (1969Gr21).
@ Main components of the wave functions are (ν 1f$_{7/2}$)^5 and ((ν 1f$_{7/2}$)^4 (ν 2p$_{3/2}$)) (1969Gr21).
& See footnote In the Adopted Levels.
a Suggested by 1968Gr11 on basis of primary G. No γ-deexcitation from this state observed.
b From 2003Au03.
c Thermal capture on an even-even target.

^{44}Ca(pol n,γ),(n,γ) E=thermal (continued)

γ(^{45}Ca)

E_γ[†]	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	δ[#]	σ^Z_γ(b)[@]	Comments
174.23[&] 7	77 12	174.26	5/2⁻	0.0	7/2⁻			0.0168 4	
349.11 10	4.2 6	2249.13	1/2⁻	1899.98	3/2⁻			0.00114 11	
464.96 12	5.2 8	1899.98	3/2⁻	1434.80	3/2⁻	D+Q		0.00125 14	δ: −0.01 4 or +4.0 7.
492.5[an] 6	0.1 1	2392.5?	1/2⁺	1899.98	3/2⁻				
565.6[abn] 10	0.3 2	3241.28	3/2⁻	2675.1?	(3/2,5/2)				placement suggested by evaluator based on (d,pγ).
576.4[a] 5	0.7 4	3418.48	1/2⁻	2842.08	3/2⁻				
814.51 10	4.8 7	2249.13	1/2⁻	1434.80	3/2⁻			0.00104 10	
[x]917.0[c] 10	≈0.5								
942.7[an] 10	0.3 2	2842.08	3/2⁻	1899.98	3/2⁻				
957.8[man] 3	1.0[m] 5	2392.5?	1/2⁺	1434.80	3/2⁻				multiple placement suggested by 1968Gr11.
957.8[man] 3	1.0[m] 5	2842.08	3/2⁻	1884.4					
1026.0[an] 6	0.4 2	3418.48	1/2⁻	2392.5?	1/2⁺				
1169.66 24	4.0 6	3418.48	1/2⁻	2249.13	1/2⁻			0.00088 15	
[x]1186.6[d] 5	0.3 2								
1260.58 7	18.3 27	1434.80	3/2⁻	174.26	5/2⁻	D+Q		0.00393 25	δ: −0.26 8 or −2.0 4.
1434.72 13	8.8 13	1434.80	3/2⁻	0.0	7/2⁻			0.00205 19	
1704.01 24		1878.30	3/2⁺	174.26	5/2⁻			0.00109 24	
1710.1[a] 4	1.1 6	1884.4		174.26	5/2⁻				
1725.68 7	44 7	1899.98	3/2⁻	174.26	5/2⁻	D+Q	+0.32 5	0.0090 4	δ: other: +11 5 ruled out by CP (1978Ve06).
[x]1751.1[de] 3	0.2[e] 1								
1900.20 12	11.8 18	1899.98	3/2⁻	0.0	7/2⁻				
1938.1[a] 5	0.5 1	3837.9	(1/2)⁻	1899.98	3/2⁻				
[x]1942[bce] 4	<1.0[e]								
1983.7 4	1.0[a] 3	3418.48	1/2⁻	1434.80	3/2⁻				
2074.71 9	7.9 12	2249.13	1/2⁻	174.26	5/2⁻			0.00160 15	
2178[dfn] 3	0.2 1	(7414.79)	1/2⁺	5237?	1/2⁻,3/2⁻				
[x]2287.4[df] 6	0.9 5								
2403.3[&] 11	1.0[a] 2	3837.9	(1/2)⁻	1434.80	3/2⁻			0.00086 14	
2415.2 3	2.2[h] 3	(7414.79)	1/2⁺	4999.68	(1/2)⁻			0.00067[h] 14	
2608.2[df] 15	1.1 6	4999.68	(1/2)⁻	2392.5?	1/2⁺				
2667.7[a] 2	3.3 5	2842.08	3/2⁻	174.26	5/2⁻				
2675[gn]		2675.1?	(3/2,5/2)	0.0	7/2⁻				
2716.0[a] 3	1.6[a] 3	4615.74	1/2⁻	1899.98	3/2⁻				
2799.10 20	3.4 5	(7414.79)	1/2⁺	4615.74	1/2⁻			0.00077 13	
2842.3[a] 3	0.7[a] 2	2842.08	3/2⁻	0.0	7/2⁻				
2947.10[fn] 20	0.3 2	(7414.79)	1/2⁺	4467.59?	1/2⁻,3/2⁻				
3066.9[a] 4	1.3[a] 2	3241.28	3/2⁻	174.26	5/2⁻				
3099.3[&] 5	0.9 2	4999.68	(1/2)⁻	1899.98	3/2⁻			0.0013 3	
3180.8[a] 3	0.7[a] 2	4615.74	1/2⁻	1434.80	3/2⁻				

$^{45}_{20}Ca_{25}$-2

^{44}Ca(pol n,γ),(n,γ) E=thermal (continued)

γ(^{45}Ca) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	σ^Z_γ(b)[@]
3243.5[c] 3	2.4 4	3418.48	1/2⁻	174.26	5/2⁻		
3565.0[a] 3	0.3 2	4999.68	(1/2)⁻	1434.80	3/2⁻		
3576.8 3	1.7[a] 5	(7414.79)	1/2⁺	3837.9	(1/2)⁻		
3609.3[ab] 3	0.7 4	3783.22	1/2⁻,3/2⁻	174.26	5/2⁻		
3631.9[a] 3	0.9[a] 2	(7414.79)	1/2⁺	3783.22	1/2⁻,3/2⁻		
3996.10 22	10.3 15	(7414.79)	1/2⁺	3418.48	1/2⁻	[E1][i]	0.00220 25
[x]4121.6[aj] 10	0.3 2						
4173.3[a] 3	2.4 4	(7414.79)	1/2⁺	3241.28	3/2⁻		
4573.3[&] 6	4.1 6	(7414.79)	1/2⁺	2842.08	3/2⁻		0.00089 19
[x]4630.3[aj] 10	≈1.0						
5165.0 3	9.7[h] 15	(7414.79)	1/2⁺	2249.13	1/2⁻	[E1][i]	0.0026[h] 3
5515.0[a] 4	54.3[a] 65	(7414.79)	1/2⁺	1899.98	3/2⁻	[E1][i]	0.0102 8
5979.6 3	10.7 16	(7414.79)	1/2⁺	1434.80	3/2⁻	[E1][i]	0.0020 3
[x]7.24×10^3[kn]	≈0.21[l]						

† From 2003ChZS, except As noted. There is generally good agreement between 1971BiZH, 1968Gr11, and 2003ChZS.

‡ Iγ per 100 N captures. Values are from 1968Gr11, except As noted, are given since they appear to Be more precise than those given by 1971BiZH. There is good agreement between the two sets of data. 1968Gr11 cited ΔIγ=10-15% for Iγ≥2.0 and ΔIγ<50% for Iγ<2.0. The upper limits are given here.

From $\gamma\gamma(\theta)$ (1969Gr21).

@ From 2003ChZS. Elemental σ^Z_γ assuming abundance=2.09% 11 (2005TuZX).

& Weighted ave. (EXT.) of 174.27 4 (1971BiZH) and 174.01 9 (2003ChZS), 2403.3 3 (1971BiZH) and 2401.2 3 (2003ChZS), 3099.7 4 (1971BiZH) and 3098.8 4 (2003ChZS), and 4572.4 4 (1971BiZH) and 4574.0 5 (2003ChZS).

a From 1971BiZH. 5515.43 20 (2003ChZS) is discrepant with least-squares fit by more than 4σ.

b 2003ChZS assign 564.5 3, 1942.67 3, and 3608.80 6 to ^{42}Ca(n,γ) to ^{44}Ca(n,γ), ^{41}Ca(n,γ), and ^{42}Ca(n,γ), respectively.

c From 1968Gr11; superimposed on background peaks.

d From 1968Gr11.

e 1971BiZH observed unassigned transitions with Eγ=1750.2 4, Iγ=0.6 2 and Eγ=1942.6 4, Iγ=0.5 1 In their anti-coincidence data. These transitions May correspond to the 1750.9 and 1940.5 γ's In (n,γ).

f Uncertain whether the peak has full-energy or double-escape character. The most likely interpretation was chosen by 1969Gr21. 2608γ confirmed In (d,pγ). 2178γ placed with 2354-keV state In β^- decay.

g From the Adopted Gammas.

h Branching ratios from Iγ and σ^Z_γ are discrepant.

i Assumed by 1969Gr21 for $\gamma\gamma(\theta)$ analysis.

j May feed the 3294- and 2786-keV states, respectively (evaluator).

k From 1969Bo31; assigned As a primary γ on the basis of coincidences between a 0.18-MeV γ and γ's with Eγ>7 MeV. 1971BiZH assigned a transition with

$^{45}_{20}Ca_{25}$-3

^{44}Ca(pol n,γ),(n,γ) E=thermal (continued)

γ(^{45}Ca) (continued)

Eγ=7247.2 *9*, Iγ=0.2 *1* to ^{7}Li In their high-energy singles data. The existence of this transition is also doubtful since J$^{\pi}$(174)=5/2^{-} would imply M2.

[l] From Iγ(7240γ)/Iγ(6000γ)≈0.02 (1969Bo31).

[m] Multiply placed with undivided intensity.

[n] Placement of transition in the level scheme is uncertain.

[x] γ ray not placed in level scheme.

$^{45}_{20}Ca_{25}$-4

^{44}Ca(pol n,γ),(n,γ) E=thermal

Level Scheme

Intensities: Iγ per 100 n captures

& Multiply placed: undivided intensity given