^{238}U(^{48}Ca,Xγ) 2006Zh42

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	ENSDF	25-Mar-2022

Includes reactions: ^{208}Pb(^{48}Ca,Xγ) and ^{14}C(^{48}Ca,α2nγ).

2006Zh42: three experiments were carried out at ATLAS-ANL facility:

1. ^{238}U(^{48}Ca,Xγ),E(^{48}Ca)=330 pulsed beam. Measured Eγ, Iγ, $\gamma\gamma$-coin, $\gamma\gamma(\theta)$(DCO) using Gammasphere array with 101 Compton-suppressed HPGe detectors. Prompt and delayed (≈40 ns to ≈350 ns after the beam pulse) spectra recorded, the latter allowed for identification of isomers and β decay related events. These were of the highest statistics among the three experiments, thus used in most analyses.
2. ^{208}Pb(^{48}Ca,Xγ),E(^{48}Ca)=305 MeV. Measured Eγ, Iγ, $\gamma\gamma$-coin using Gammasphere array with 100 Compton-suppressed HPGe detectors.
3. ^{14}C(^{48}Ca,α2nγ),E(^{48}Ca)=130 MeV. Enriched, 90% ^{14}C target. Reaction products were analyzed by Argonne Fragment Mass Analyzer (FMA). Parallel-grid avalanche counter (PGAC) was used to detect recoils and Gammasphere array with 100 Compton-suppressed HPGe detectors was used to detect γ rays. Measured Eγ, Iγ, $\gamma\gamma$-coin, $\gamma(\theta)$.

Comparisons with theoretical calculations using shell-model with GXPF1A interaction, and with total Routhian surfaces (TRS).

^{56}Cr Levels

E(level)[†]	J$^{\pi}$[‡]	Comments
0.0[#]	0$^+$	
1006.90[#] *10*	2$^+$	
1831.75 *14*	2$^+$	
2076.89[#] *14*	4$^+$	
2278.58 *18*	3$^+$	
2688.00 *20*	4$^+$	
2823.01 *18*	4$^+$	
3116.8 *6*		E(level): from ^{238}U(^{48}Ca,Xγ) only.
3251.93[#] *17*	6$^+$	
3528.56 *22*	5$^+$	
3841.20 *19*	6$^+$	
4157.61 *20*	(6,7)	
4448.05[@] *19*	7$^-$	
4732.53 *22*	(6,7)	
4751.11[#] *19*	8$^+$	
5268.8 *3*	8	
5601.67[@] *20*	9$^-$	
6295.5 *8*	(9)	
6518.4[#] *5*	10$^+$	
6873.05 *22*		
6879.2 *3*		
7057.39[@] *22*	11$^-$	
7692.1? *3*		
8465.7[#] *17*	(12$^+$)	
8768.3[@] *3*	13$^-$	
10850.3[@] *5*	(15$^-$)	
13159.7[@] *11*	(17$^-$)	

[†] From least-squares fit to Eγ data. Uncertainties of 534.9γ, 606.5γ and 1763.8γ were doubled to get an acceptable fit. The normalized χ^2 is 3.6 as compared to critical χ^2=2.3 using uncertainties as listed by 2006Zh42.

[‡] As assigned in 2006Zh42, based on multipolarities implied from their $\gamma(\theta)$ and $\gamma\gamma(\theta)$(DCO) data, and band associations.

Continued on next page (footnotes at end of table)

^{238}U(^{48}Ca,Xγ) 2006Zh42 (continued)

^{56}Cr Levels (continued)

[#] Band(A): g.s. band.
[@] Band(B): Band based on 7$^-$, 4448.0.

$\gamma(^{56}Cr)$

DCO values correspond to angles of 90° and 180° (or 0°) gated on ΔJ=2, quadrupole transitions, measured in ^{238}U(^{48}Ca,Xγ) reaction. Expected DCO values of ≈1.0 for ΔJ-2, quadrupole and ≈0.5-0.6 for ΔJ=1, dipole transitions.

E_γ	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ	Comments
222.9 *10*	0.16 *3*	6518.4	10$^+$	6295.5	(9)			
332.7 *2*	0.46 *4*	5601.67	9$^-$	5268.8	8	D		A_2=−0.266 *81*; DCO=0.6 *5*
409.4 *1*	2.44 *10*	2688.00	4$^+$	2278.58	3$^+$	D		A_2=−0.365 *61*; DCO=0.9 *4*
446.8 *1*	4.94 *20*	2278.58	3$^+$	1831.75	2$^+$	D		A_2=−0.231 *45*; DCO=0.7 *2*
534.9[‡] *4*	0.62 *5*	5268.8	8	4732.53	(6,7)			
574.9 *1*	2.92 *13*	4732.53	(6,7)	4157.61	(6,7)			A_2=+0.133 *55*; A_4=−0.781 *73*; DCO=1.0 *4*
589.2 *1*	8.3 *3*	3841.20	6$^+$	3251.93	6$^+$	D+Q	≈+1.2	A_2=−0.029 *38*; A_4=−0.273 *51*; DCO=1.1 *3* Mult.: ΔJ=0 transition.
606.5[‡] *1*	6.90 *24*	4448.05	7$^-$	3841.20	6$^+$	D		A_2=−0.566 *44*; DCO=0.6 *2*
629.0 *1*	0.15 *4*	4157.61	(6,7)	3528.56	5$^+$			
704.0 *10*	1.31 *9*	3528.56	5$^+$	2823.01	4$^+$	D		A_2=−0.490 *96*; DCO=0.5 *3*
746.1 *1*	3.17 *19*	2823.01	4$^+$	2076.89	4$^+$	D		A_2=+0.221 *73*; A_4=+0.034 *98*; DCO=0.5 *2* Mult.: ΔJ=0 transition.
812.9[@] *1*	0.68 *7*	7692.1?		6879.2				
824.8 *1*	8.1 *4*	1831.75	2$^+$	1006.90	2$^+$	D+Q		DCO=0.8 *3*
839.0 *10*	0.73 *5*	3528.56	5$^+$	2688.00	4$^+$	D		DCO=0.3 *3*
850.6 *1*	4.85 *19*	5601.67	9$^-$	4751.11	8$^+$	D		DCO=0.6 *2*
905.7 *1*	3.78 *19*	4157.61	(6,7)	3251.93	6$^+$			
1006.9 *1*	100.0 *3*	1006.90	2$^+$	0.0	0$^+$	Q		A_2=+0.102 *15*; A_4=−0.067 *19*
1039.9 *5*	5.4 *5*	3116.8		2076.89	4$^+$			
1070.0 *1*	92.0 *3*	2076.89	4$^+$	1006.90	2$^+$	Q		A_2=+0.159 *15*; A_4=−0.080 *20*; DCO=1.1 *1*
1153.6 *1*	16.4 *5*	5601.67	9$^-$	4448.05	7$^-$	Q		A_2=+0.271 *29*; A_4=−0.226 *41*; DCO=1.5 *3*
1175.1 *1*	64.5 *20*	3251.93	6$^+$	2076.89	4$^+$	Q		A_2=+0.237 *18*; A_4=−0.138 *23*; DCO=1.1 *1*
1196.2 *1*	21.3 *7*	4448.05	7$^-$	3251.93	6$^+$	D		A_2=−0.287 *26*; DCO=0.5 *1*
1205.5[@] *10*	0.62 *8*	4732.53	(6,7)	3528.56	5$^+$			
1248.4 *10*	0.58 *7*	3528.56	5$^+$	2278.58	3$^+$			
1277.5 *2*	2.62 *14*	6879.2		5601.67	9$^-$			
1426.9 *6*	1.00 *11*	5268.8	8	3841.20	6$^+$			DCO=0.8 *6*
1455.7 *1*	10.0 *4*	7057.39	11$^-$	5601.67	9$^-$	Q		A_2=+0.323 *40*; A_4=−0.133 *53*; DCO=1.3 *3*
1499.2 *1*	17.4 *6*	4751.11	8$^+$	3251.93	6$^+$	Q		A_2=+0.280 *35*; A_4=−0.122 *47*; DCO=1.2 *3*
1544.3 *10*	0.50 *12*	6295.5	(9)	4751.11	8$^+$			
1710.9 *2*	3.26 *16*	8768.3	13$^-$	7057.39	11$^-$	(Q)		A_2=+0.402 *79*; A_4=−0.004 *109*
1763.8 *4*	6.5 *3*	3841.20	6$^+$	2076.89	4$^+$	Q		A_2=+0.168 *44*; A_4=−0.076 *58*
1767.3[‡] *2*	2.67 *21*	6518.4	10$^+$	4751.11	8$^+$	Q		A_2=+0.168 *44*; A_4=−0.076 *58*
1947.2 *16*	0.58 *12*	8465.7	(12$^+$)	6518.4	10$^+$			
2081.9 *3*	0.70 *12*	10850.3	(15$^-$)	8768.3	13$^-$			
2121.9 *1*	1.05 *15*	6873.05		4751.11	8$^+$			
2309.4 *10*	0.22 *12*	13159.7	(17$^-$)	10850.3	(15$^-$)			

[†] From ^{238}U(^{48}Ca,Xγ) reaction.
[‡] Uncertainty doubled for fitting purpose.
[#] Assigned by evaluator based on $\gamma(\theta)$ and $\gamma\gamma(\theta)$(DCO) data in 2006Zh42.
[@] Placement of transition in the level scheme is uncertain.

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Level Scheme

Intensities: Relative I_γ

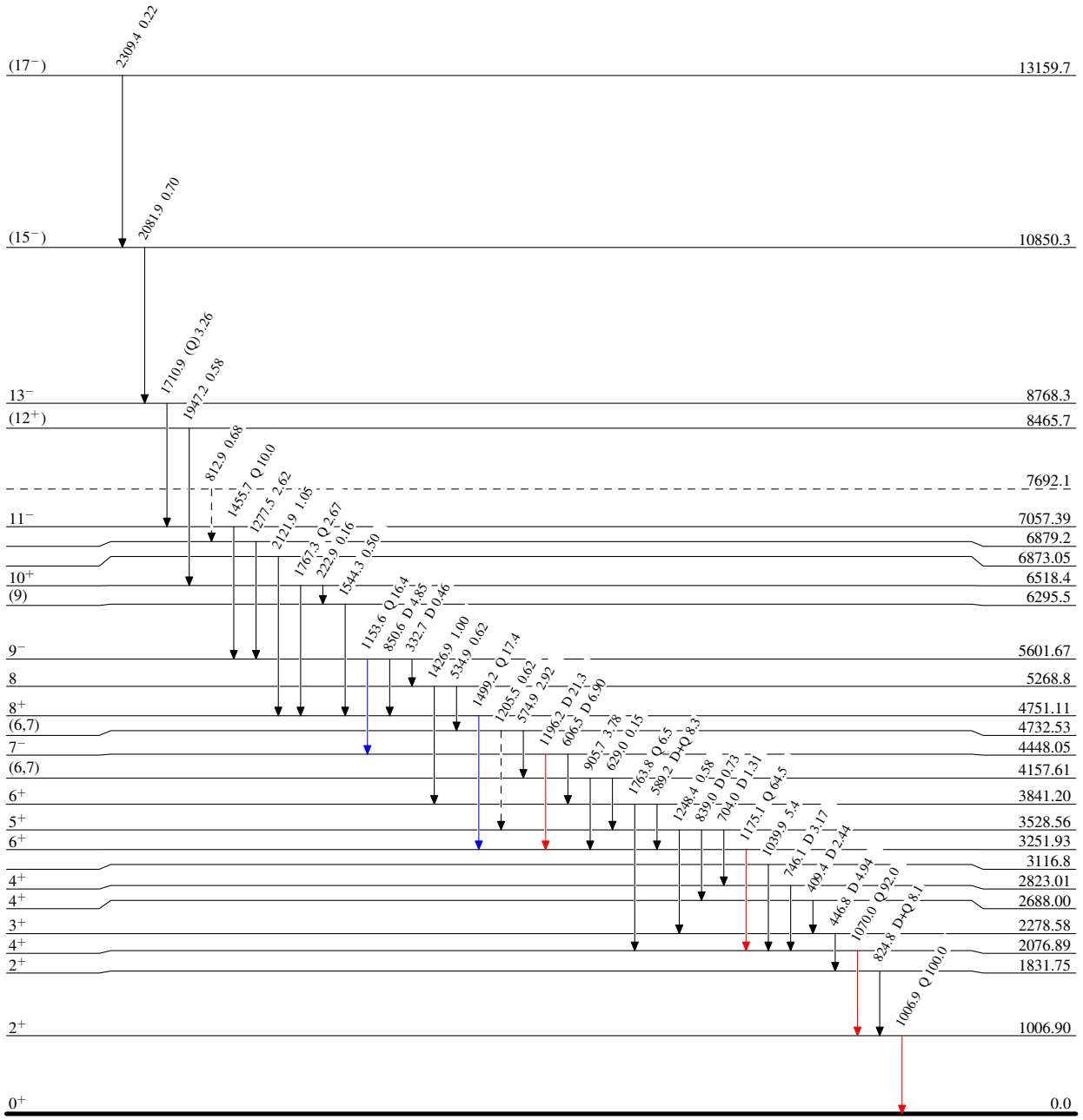
Legend

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

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

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

γ Decay (Uncertain)



$^{56}_{24}Cr_{32}$

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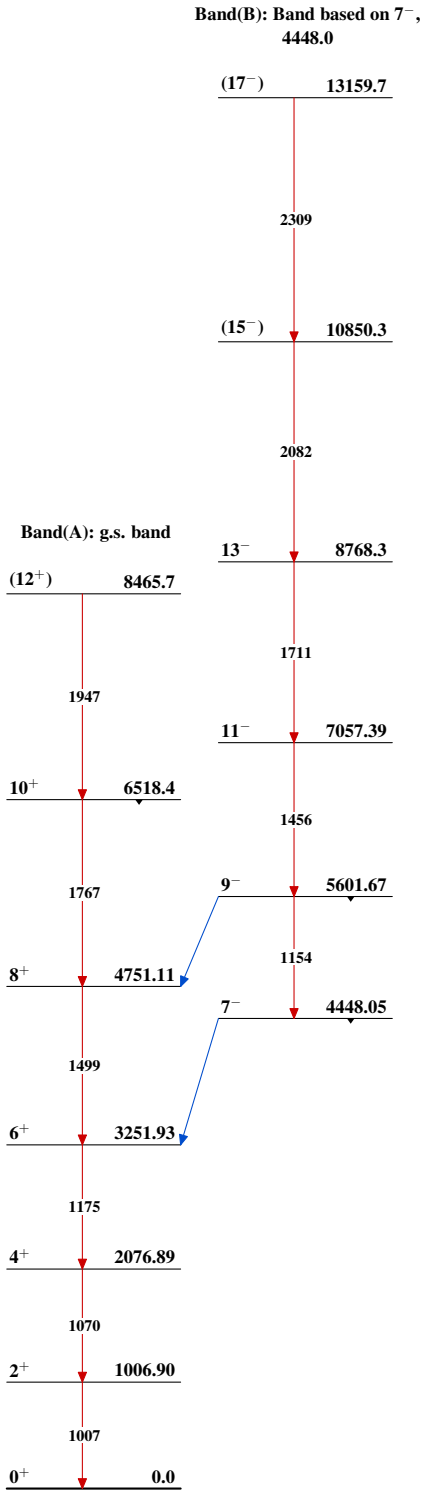

$^{56}_{24}Cr_{32}$