^{238}U(^{64}Ni,Xγ) 2012Ch09

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 202,59 (2025)	25-Feb-2025

Adapted from the XUNDL dataset for 2012Ch09, compiled by M. Birch and B. Singh (McMaster) on February 17, 2012.
2012Ch09: E=430 MeV ^{64}Ni beam was produced from the ATLAS accelerator at ANL. Target was 55 mg/cm^2 enriched ^{238}U. γ rays were detected with the Gammasphere array with one hundred Compton-suppressed HPGe detectors used. Measured Eγ, Iγ, $\gamma\gamma$-coin, $\gamma(\theta)$, $\gamma\gamma(\theta)$. Deduced levels, J, π, γ-ray multipolarities, mixing ratios. Comparison with shell-model calculations.

^{65}Cu Levels

E(level)[†‡]	J$^\pi$[#]	E(level)[†‡]	J$^\pi$[#]	E(level)[†‡]	J$^\pi$[#]	E(level)[†‡]
0.0	3/2$^-$	2279.17 *10*	7/2$^-$	3659.81 *11*	13/2$^+$	5486.03 *17*
1115.60 *7*	5/2$^-$	2406.21 *9*	(7/2,9/2)$^-$	4006.46 *13*	13/2$^+$	6233.23 *27*
1481.81 *7*	7/2$^-$	2533.71 *8*	9/2$^+$	4074.73 *14*	(15/2)$^+$	
1623.73 *24*	5/2$^-$	2998.19 *11*	11/2$^-$	4355.92 *16*	17/2$^+$	
2094.17 *7*	7/2$^-$	3547.69 *19*	(11/2)$^+$	4936.54 *16*		

† Additional information 1.
‡ From a least-squares fit to γ-ray energies.
# As given in 2012Ch09, based on measured $\gamma(\theta)$ and γ-ray decay pattern, and shell-model predictions.

γ(^{65}Cu)

A_2 and A_2 values under comments are from 2012Ch09, deduced from unpublished data of ^{48}Ca+^{26}Mg reaction at ANL.

E$_\gamma$[†]	I$_\gamma$[†]	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Mult.[‡]	δ[‡]	Comments
254.5 *1*	25.5 *6*	2533.71	9/2$^+$	2279.17	7/2$^-$	D[@]		A_2=−0.25 *5*; A_4=0.00 *7*
281.1 *1*	30.9 *5*	4355.92	17/2$^+$	4074.73	(15/2)$^+$	D+Q[@]	+0.4	A_2=+0.20 *2*; A_4=−0.05 *2* Evaluator's note: positive A_2 from $\gamma(\theta)$ is inconsistent with ΔJ=1.
312.1 *5*	11.8 *4*	2406.21	(7/2,9/2)$^-$	2094.17	7/2$^-$			
350.0 *3*	7 *3*	4355.92	17/2$^+$	4006.46	13/2$^+$	Q[#]		A_2=+0.33 *13*; A_4=0
366.3 *5*	16.6 *5*	1481.81	7/2$^-$	1115.60	5/2$^-$	D(+Q)[@]	0.0	A_2=−0.23 *7*; A_4=0.00 *9*
414.8 *1*	68.2 *11*	4074.73	(15/2)$^+$	3659.81	13/2$^+$	D(+Q)[@]		A_2=+0.15 *3*; A_4=0.00 *4* Evaluator's note: positive A_2 from $\gamma(\theta)$ is inconsistent with ΔJ=1.
439.5 *1*	100 *3*	2533.71	9/2$^+$	2094.17	7/2$^-$	D[@]		A_2=−0.17 *3*; A_4=+0.04 *4*
458.4 *7*	5 *2*	4006.46	13/2$^+$	3547.69	(11/2)$^+$			
470.5 *5*	7 *4*	2094.17	7/2$^-$	1623.73	5/2$^-$			
507.9 *10*	7 *4*	1623.73	5/2$^-$	1115.60	5/2$^-$			
527.4 *3*	4.5 *2*	4074.73	(15/2)$^+$	3547.69	(11/2)$^+$	(Q)[#]		A_2=+0.03 *10*; A_4=0
549.5 *2*	6 *2*	5486.03		4936.54		D+Q[#]		A_2=−0.29 *16*; A_4=0
591.9 *1*	32 *9*	2998.19	11/2$^-$	2406.21	(7/2,9/2)$^-$			
612.1 *2*	18.2 *5*	2094.17	7/2$^-$	1481.81	7/2$^-$	D+Q[#]		A_2=−0.45 *32*; A_4=0 Mult.: ΔJ=0 transition. Evaluator's note: negative A_2 from $\gamma(\theta)$ is inconsistent with ΔJ=0.
656[&]	≈5	2279.17	7/2$^-$	1623.73	5/2$^-$			
661.5 *1*	31.8 *12*	3659.81	13/2$^+$	2998.19	11/2$^-$	D[@]		A_2=−0.14 *11*; A_4=+0.04 *12*
696.6 *5*	32.7 *4*	4355.92	17/2$^+$	3659.81	13/2$^+$	Q[#]		A_2=+0.25 *18*; A_4=0

Continued on next page (footnotes at end of table)

^{238}U(^{64}Ni,Xγ) 2012Ch09 (continued)

$\gamma(^{65}Cu)$ (continued)

E_γ[†]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	δ[‡]	Comments
747.2 *2*	5 *2*	6233.23		5486.03				
861.8 *1*	16.4 *14*	4936.54		4074.73	$(15/2)^+$	D+Q[#]	≈−1.0	A_2=−0.63 *11*; A_4=0
924.3 *1*	27.3 *5*	2406.21	$(7/2,9/2)^-$	1481.81	$7/2^-$			
978.5 *1*	53.7 *16*	2094.17	$7/2^-$	1115.60	$5/2^-$	D+Q[@]	+0.4	A_2=+0.21 *3*; A_4=−0.06 *4* Evaluator′s note: positive A_2 from $\gamma(\theta)$ is inconsistent with ΔJ=1.
1014.1 *2*	19 *3*	3547.69	$(11/2)^+$	2533.71	$9/2^+$			
1052.1 *1*	91 *2*	2533.71	$9/2^+$	1481.81	$7/2^-$	D[@]		A_2=−0.21 *20*; A_4=−0.03 *23*
1115.5 *1*	91 *9*	1115.60	$5/2^-$	0.0	$3/2^-$	D+Q[@]	−0.1	A_2=−0.37 *5*; A_4=+0.03 *5*
1126.1 *1*	77 *3*	3659.81	$13/2^+$	2533.71	$9/2^+$	Q		A_2=+0.18 *5*; A_4=−0.03 *6*
1130.1 *1*	8.2 *5*	5486.03		4355.92	$17/2^+$			
1163.5 *1*	31 *4*	2279.17	$7/2^-$	1115.60	$5/2^-$			
1290.6 *1*	18 *9*	2406.21	$(7/2,9/2)^-$	1115.60	$5/2^-$			
1472.8 *1*	16 *3*	4006.46	$13/2^+$	2533.71	$9/2^+$			
1481.8 *1*	91 *12*	1481.81	$7/2^-$	0.0	$3/2^-$			
1516.2 *2*	8.2 *3*	2998.19	$11/2^-$	1481.81	$7/2^-$			
1623.8 *3*	12 *9*	1623.73	$5/2^-$	0.0	$3/2^-$			
2094.2 *1*	31.8 *7*	2094.17	$7/2^-$	0.0	$3/2^-$			
2534.1 *10*	7.0 *13*	2533.71	$9/2^+$	0.0	$3/2^-$			

[†] From 2012Ch09.
[‡] From 2012Ch09, based on measured $\gamma(\theta)$.
[#] A_4 coefficient in $\gamma(\theta)$ analysis was constrained to zero to avoid an unphysical or unreliable result (2012Ch09).
[@] ΔJ=1 transition from $\gamma(\theta)$ (2012Ch09).
[&] Placement of transition in the level scheme is uncertain.

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Level Scheme

Intensities: Relative I_γ

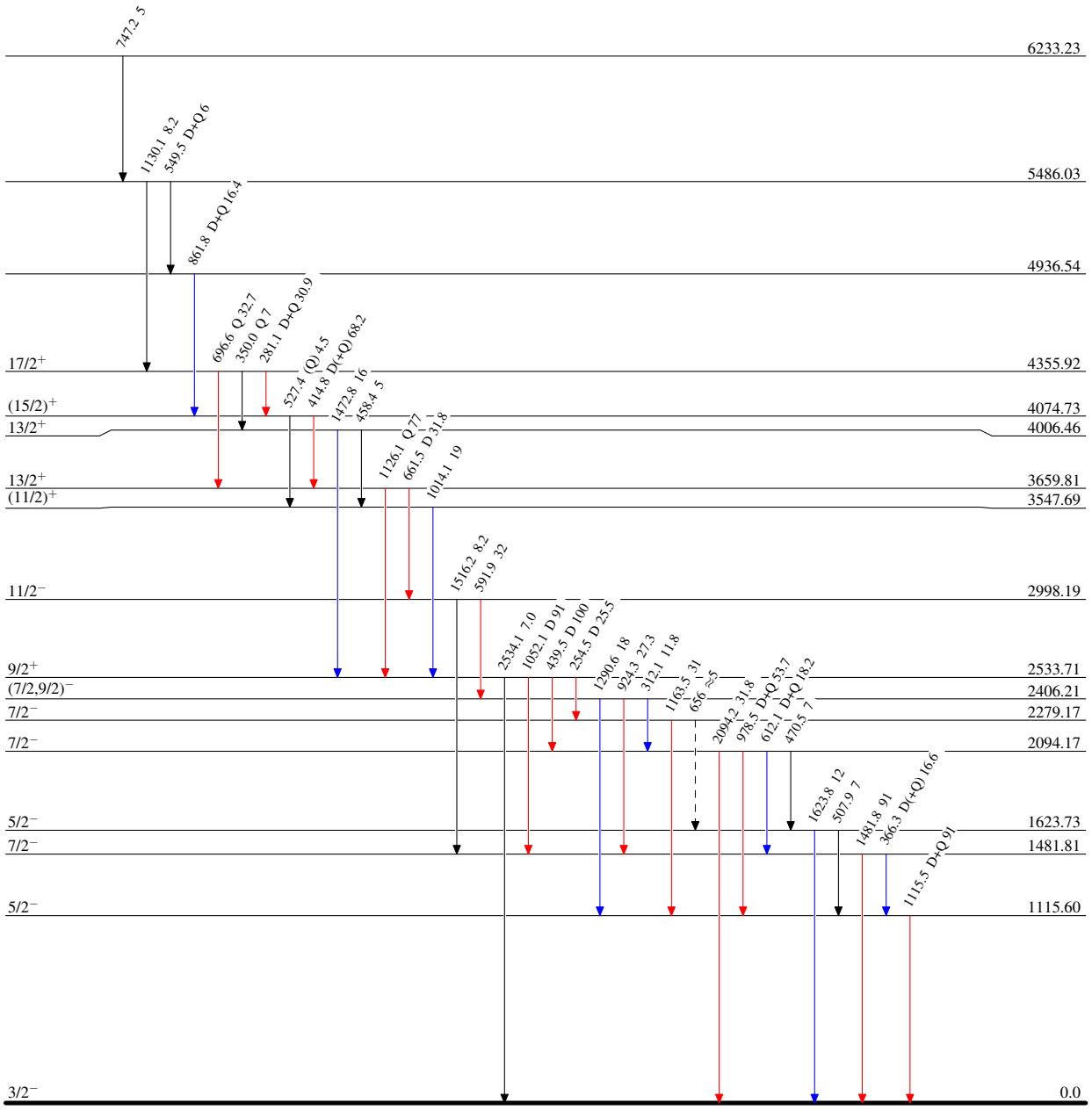
Legend

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

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

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

γ Decay (Uncertain)



$^{65}_{29}Cu_{36}$