^{238}U(^{12}C,Fγ) 2014As02

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 146, 1 (2017)	30-Sep-2017

2014As02: E=90 MeV ^{12}C beam was produced from the Legnaro XTU tandem accelerator. Target was 47 mg/cm^2 ^{238}U. γ rays were detected with the Euroball array of 15 cluster Ge detectors at IRFU. Measured Eγ, Iγ, $\gamma\gamma$-coin, γ(t). Deduced levels, J, π. Comparisons with shell-model calculations for semi-magic nucleus ^{138}La and odd-odd isotone ^{136}Cs.

^{138}La Levels

E(level)[†]	J$^\pi$[‡]	T$_{1/2}$	Comments
0.0	5$^+$		
739.2[#] *5*	7$^-$	2.0 μs *3*	%IT=100 T$_{1/2}$: from 2014As02, deduced from measured imbalance in intensity using a time window of 300 ns.
837.0[#] *7*	(8$^-$)		
1257.4[#] *8*	(9)$^-$		
2002.0[#] *8*	(10$^-$)		
2353.2[#] *9*	(11$^-$)		
2476.6[#] *9*	(12$^-$)		
2939.0[#] *10*	(13$^-$)		
3190.4[#] *10*	(14$^-$)		
3515.2[@] *10*	(13$^+$)		
3574.9 *10*	(14$^-$)		
3726.2 *11*	(14$^+$)		
3772.1[@] *11*	(14$^+$)		
3961.2 *11*	(15$^+$)		
4099.5 *11*	(15$^-$)		
4152.9[@] *12*	(15$^+$)		
4468.3[#] *11*	(16$^-$)		

[†] From a least-squares fit to γ-ray energies.
[‡] Proposed in 2014As02 based on band structures and comparisons with shell-model predictions.
[#] Band(A): γ cascade based on 7$^-$. Members of $\pi g_{7/2}\otimes\nu h_{11/2}$ and/or $\pi d_{5/2}\otimes\nu h_{11/2}$ multiplet.
[@] Band(B): γ cascade based on (13$^+$).

γ(^{138}La)

E$_\gamma$	I$_\gamma$[†]	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Mult.	Comments
97.8 *5*		837.0	(8$^-$)	739.2	7$^-$		Intensity is large but undetermined since it is unresolved from K$_\alpha$ x rays of uranium which are in coincidence with γ rays from fission fragments (2014As02).
123.4 *3*	37 *8*	2476.6	(12$^-$)	2353.2	(11$^-$)	M1	α(exp)=0.5 *2* (2014As02) Mult.: proposed by 2014As02 based on measured α(exp).
211.0 *3*	14 *4*	3726.2	(14$^+$)	3515.2	(13$^+$)		
235.0 *3*	10 *3*	3961.2	(15$^+$)	3726.2	(14$^+$)		
251.4 *3*	10 *3*	3190.4	(14$^-$)	2939.0	(13$^-$)		
256.9 *4*	5 *2*	3772.1	(14$^+$)	3515.2	(13$^+$)		
351.2 *3*	70 *10*	2353.2	(11$^-$)	2002.0	(10$^-$)		
368.8 *5*	2 *1*	4468.3	(16$^-$)	4099.5	(15$^-$)		
380.8 *5*	3.0 *15*	4152.9	(15$^+$)	3772.1	(14$^+$)		

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^{238}U(^{12}C,Fγ) 2014As02 (continued)

γ(^{138}La) (continued)

E_γ	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	Comments
420.3 *4*	20 *5*	1257.4	$(9)^-$	837.0	(8^-)		
462.4 *4*	20 *5*	2939.0	(13^-)	2476.6	(12^-)		
739.2 *5*	≈10	739.2	7^-	0.0	5^+	(M2)	Mult.: proposed by 2014As02 based on transition energy and $T_{1/2}$. Weak intensity probably due to the half-life of its parent level long enough to lower its relative intensity (2014As02).
744.6 *3*	20 *5*	2002.0	(10^-)	1257.4	$(9)^-$		
1038.6 *5*	20 *5*	3515.2	(13^+)	2476.6	(12^-)		
1098.3 *5*	7 *3*	3574.9	(14^-)	2476.6	(12^-)		
1160.6 *5*	4.4 *18*	4099.5	(15^-)	2939.0	(13^-)		
1165.0 *3*	80 *10*	2002.0	(10^-)	837.0	(8^-)		
1277.8 *5*	3.0 *15*	4468.3	(16^-)	3190.4	(14^-)		

[†] Normalized to 100 for Iγ(1165)+Iγ(420).

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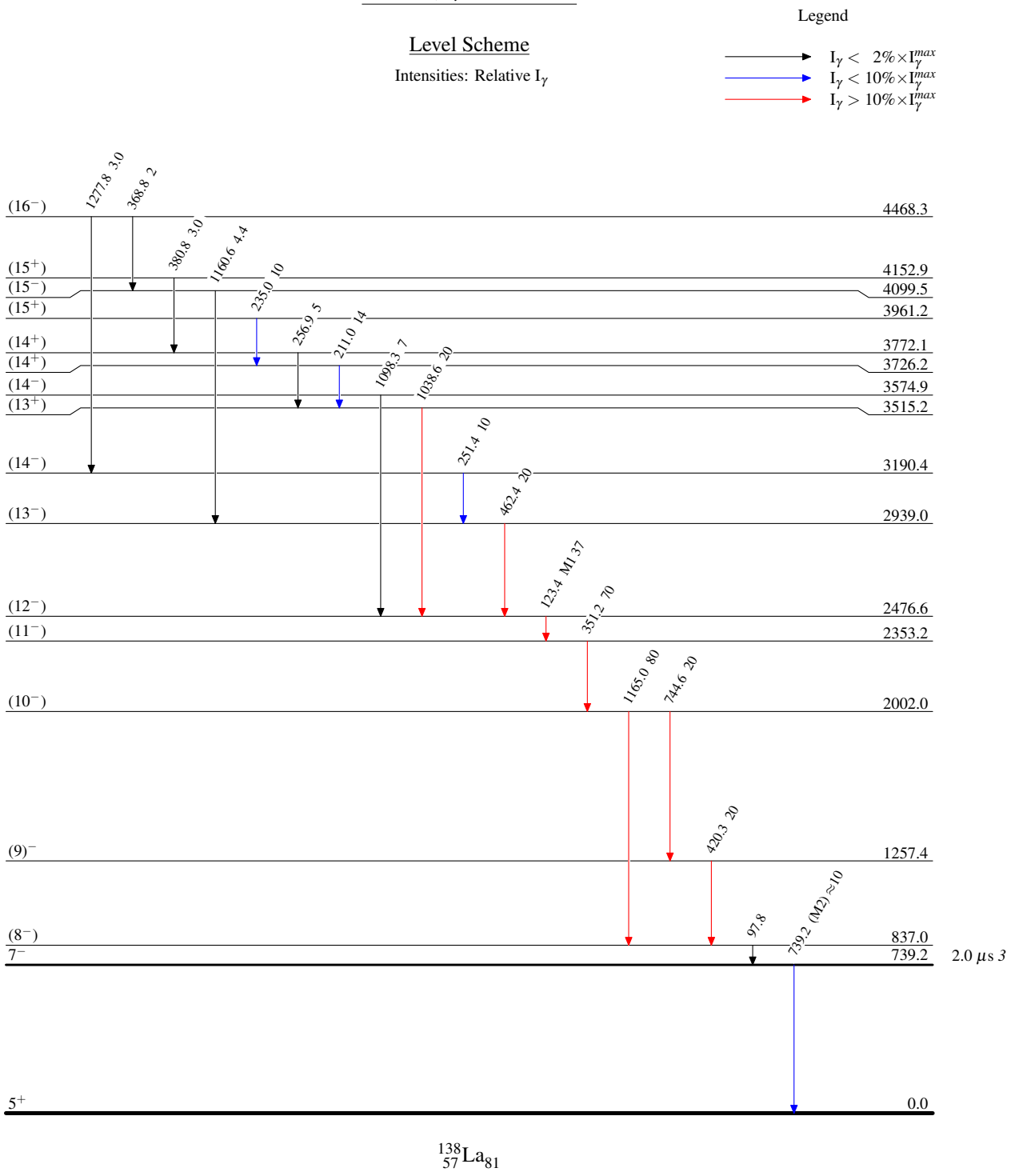
Level Scheme

Intensities: Relative I_γ



$^{138}_{57}La_{81}$

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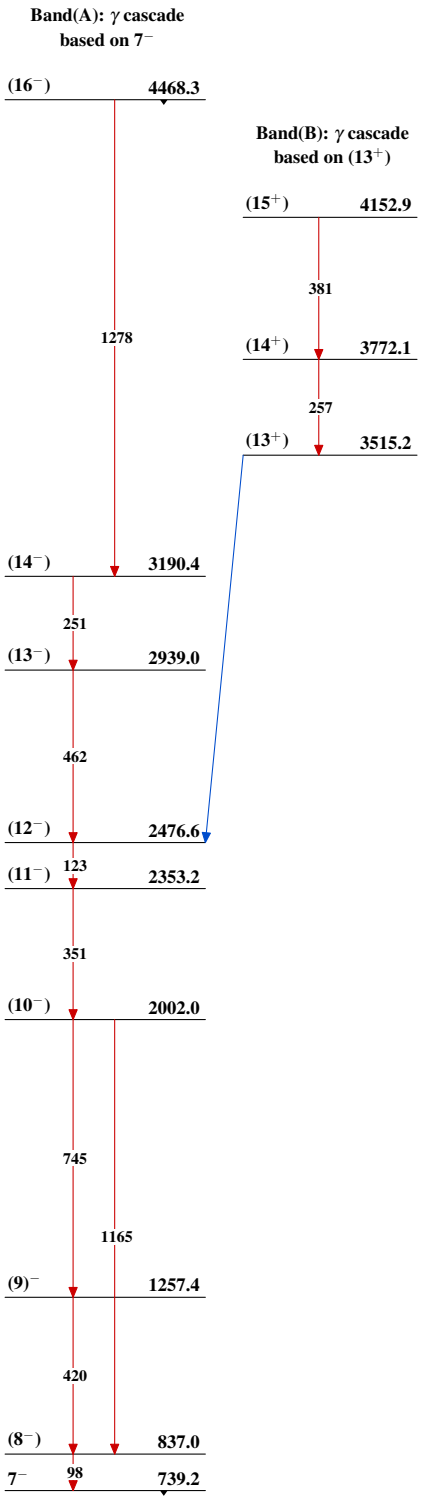

$^{138}_{57}La_{81}$