$^{13}C(^{48}Ca,pn\gamma)$ 2010St01

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. Shamsuzzoha Basunia	NDS 151, 1 (2018)	1-Apr-2018

Includes $^{14}C(^{48}Ca,p2n\gamma)$ reaction.

Enriched ^{13}C and ^{14}C targets. ^{48}Ca beam, E=130 MeV, from ATLAS facility at Argonne. Detected charged ions with the Fragment Mass Analyzer. Measured Eγ, Iγ, $\gamma\gamma$ coin, and $\gamma(\theta)$ using GAMMASPHERE array of 91 and 100 Compton-suppressed HPGe detectors in two different experiments.

^{59}Mn Levels

E(level)[†]	J$^\pi$[‡]	Comments
0.0[&]	5/2$^-$	
112.10[a] *10*	7/2$^-$	
1048.58[&] *13*	9/2$^-$	
1300.94[a] *13*	11/2$^-$	
1861.74[d] *17*	(9/2$^-$)	
2343.34[d] *20*	(11/2$^-$)	
2640.70[&] *25*	(13/2$^-$)	
2722.44[d] *22*	(13/2$^-$)	
2740.84[b] *21*	(11/2)	
2922.12[a] *16*	15/2$^-$	
3038.28?[b] *20*	(13/2)	E(level): ordering of the 181-297 γ cascade is not established. Reversed ordering will give a level at 2922 keV, different from the 2922, 15/2$^-$ level.
3190.4[c] *4*	(13/2)	
3219.52[b] *19*	(15/2)	J$^\pi$: 17/2 is not ruled out.
3452.2[c] *3*	(15/2)	
3673.35[b] *24*	(17/2)	
3681.81[#] *19*	(17/2)	
3767.0 *4*		
3874.12[c] *25*	(17/2)	
4267.8[c] *3*	(19/2)	
4344.3[b] *3*	(19/2)	
4368.10[@] *21*	(19/2)	
4988.4[c] *3*	(21/2)	
5186.6[b] *4*	(21/2)	
5238.40[#] *25*	(21/2)	
5800.9[c] *4*	(23/2)	
5987.2[e] *8*	(23/2)	
6234.6[@] *3*	(23/2)	
6681.9 *3*		
6784.6[e] *8*	(25/2)	
7146.9[#] *4*	(25/2)	
7321.4 *17*		
7458? *7*		
7607.9? *8*		
7749.9?[e] *5*	(27/2)	
7758.4 *11*		

[†] From least-squares fit to Eγ's. Reduced χ^2=2.0; Critical χ^2=1.9.

[‡] From 2010St01 – based on band assignment and γ-ray placement in the level scheme from ΔJ, obtained from γ-ray angular

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$^{13}C(^{48}Ca,pn\gamma)$ 2010St01 (continued)

^{59}Mn Levels (continued)

distribution measurements.
[#] Band(A): Band based on (17/2), α=+1/2.
[@] Band(a): Band based on (19/2), α=−1/2.
[&] Band(B): Band based on 5/2$^-$, α=+1/2.
[a] Band(b): Band based on 7/2$^-$, α=−1/2.
[b] Band(C): ΔJ=1 band based on (11/2).
[c] Band(D): ΔJ=1 band based on (13/2).
[d] Band(E): ΔJ=1 band based on (9/2$^-$).
[e] Band(F): ΔJ=1 band based on (23/2).

$\gamma(^{59}Mn)$

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	Comments
112.1 *1*	100 *3*	112.10	7/2$^-$	0.0	5/2$^-$	D	A_2=−0.19 *2*
181.2[‡] *1*	5.6 *3*	3219.52	(15/2)	3038.28?	(13/2)		
252.5 *1*	13.6 *5*	1300.94	11/2$^-$	1048.58	9/2$^-$	D	A_2=−0.31 *9*
261.9 *1*	2.9 *2*	3452.2	(15/2)	3190.4	(13/2)	(D)	A_2<0
281.9 *3*	1.1 *2*	2922.12	15/2$^-$	2640.70	(13/2$^-$)		
297.4[‡] *1*	5.6 *3*	3038.28?	(13/2)	2740.84	(11/2)	D	A_2=−0.10 *4* for unresolved 297.5+297.4.
297.5 *1*	23.7 *9*	3219.52	(15/2)	2922.12	15/2$^-$	D	A_2=−0.10 *4* for unresolved 297.5+297.4.
379.1 *1*	1.4 *2*	2722.44	(13/2$^-$)	2343.34	(11/2$^-$)		
393.6 *1*	18.5 *7*	4267.8	(19/2)	3874.12	(17/2)	D	A_2=−0.26 *6*
422.0 *2*	2.8 *2*	3874.12	(17/2)	3452.2	(15/2)	D	A_2=−0.33 *14*
447.3 *1*	1.9 *2*	6681.9		6234.6	(23/2)		
454.2 *2*	21.3 *8*	3673.35	(17/2)	3219.52	(15/2)		
470.0 *2*	1.9 *3*	4344.3	(19/2)	3874.12	(17/2)		
478.7 *2*	0.25 *21*	3219.52	(15/2)	2740.84	(11/2)		
481.6 *1*	2.4 *3*	2343.34	(11/2$^-$)	1861.74	(9/2$^-$)		
550.0[#] *10*	0.51 *18*	3190.4	(13/2)	2640.70	(13/2$^-$)		
560.8 *1*	5.2 *4*	1861.74	(9/2$^-$)	1300.94	11/2$^-$		
594.5 *3*	5.5 *3*	4267.8	(19/2)	3673.35	(17/2)		
611.5 *10*	4.1 *3*	7758.4		7146.9	(25/2)		
644.5 *3*	0.56 *21*	4988.4	(21/2)	4344.3	(19/2)		
671.2 *2*	8.3 *4*	4344.3	(19/2)	3673.35	(17/2)		
686.3 *1*	4.5 *4*	4368.10	(19/2)	3681.81	(17/2)		
720.5 *2*	9.7 *5*	4988.4	(21/2)	4267.8	(19/2)		
759.7 *1*	7.1 *5*	3681.81	(17/2)	2922.12	15/2$^-$		
797.4 *2*	1.4 *4*	6784.6	(25/2)	5987.2	(23/2)		
812.5 *2*	5.8 *4*	5800.9	(23/2)	4988.4	(21/2)		
842.3 *6*	1.5 *3*	5186.6	(21/2)	4344.3	(19/2)		
870.3 *2*	3.9 *4*	5238.40	(21/2)	4368.10	(19/2)		
912.3 *2*	2.0 *4*	7146.9	(25/2)	6234.6	(23/2)		
918.8 *2*	1.0 *3*	5186.6	(21/2)	4267.8	(19/2)		
936.6 *1*	26.2 *13*	1048.58	9/2$^-$	112.10	7/2$^-$		A_2=+0.62 *7*
951.1 *3*	20.1 *10*	3874.12	(17/2)	2922.12	15/2$^-$		
965.4[#] *10*	0.3 *3*	7749.9?	(27/2)	6784.6	(25/2)		
996.2 *1*	2.6 *5*	6234.6	(23/2)	5238.40	(21/2)		
1047.4 *6*	2.2 *3*	4267.8	(19/2)	3219.52	(15/2)		
1048.5[#] *4*	0.6 *5*	1048.58	9/2$^-$	0.0	5/2$^-$		
1126.3 *3*	2.3 *5*	3767.0		2640.70	(13/2$^-$)		
1188.7 *1*	76 *3*	1300.94	11/2$^-$	112.10	7/2$^-$	Q	A_2=+0.32 *5*; A_4=−0.16 *6*
1315.3 *4*	3.8 *4*	4988.4	(21/2)	3673.35	(17/2)		
1340.5 *4*	7.6 *7*	2640.70	(13/2$^-$)	1300.94	11/2$^-$		

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$^{13}C(^{48}Ca,pn\gamma)$ 2010St01 (continued)

$\gamma(^{59}Mn)$ (continued)

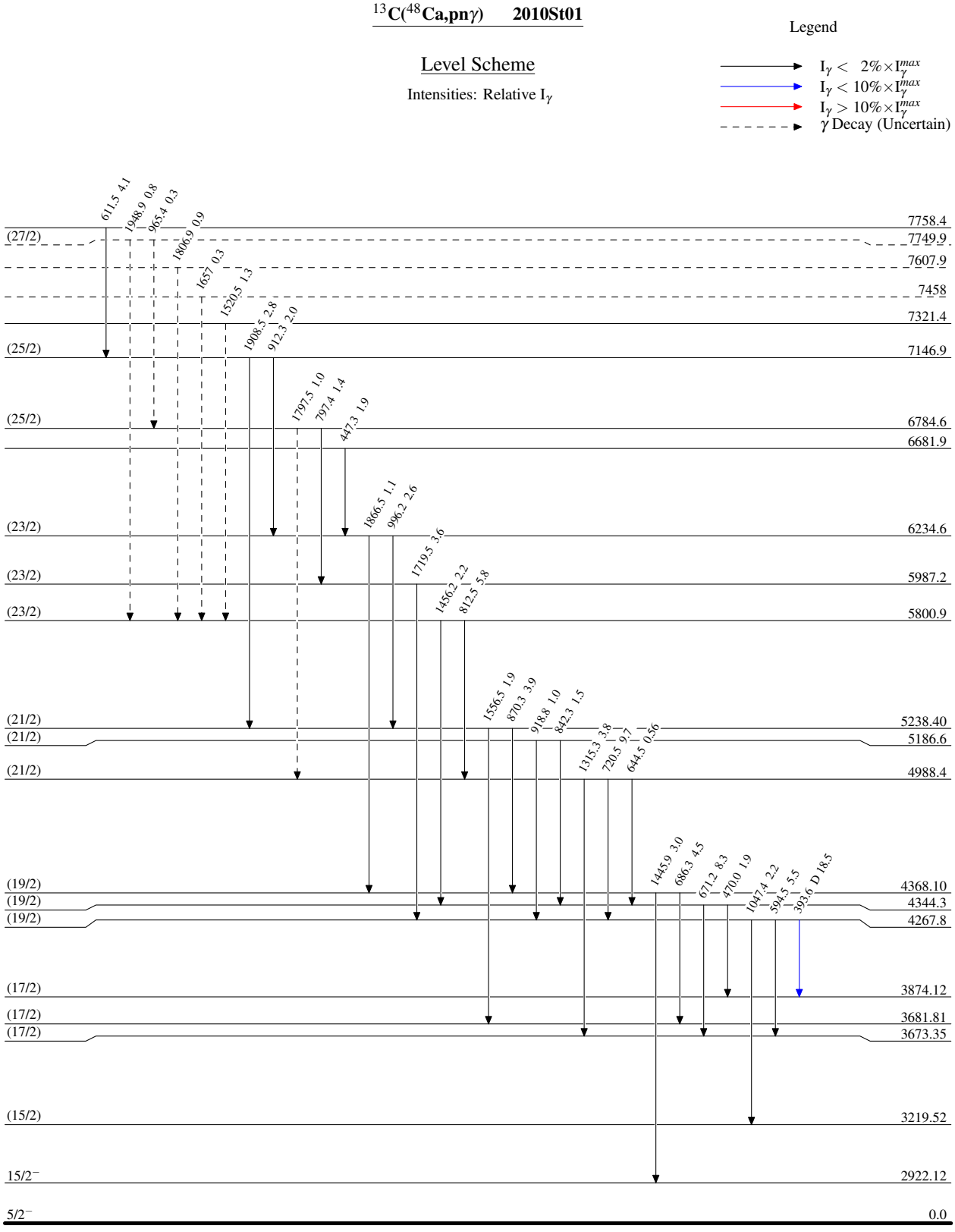
E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[†]	Comments
1440.0 *10*	2.7 *8*	2740.84	(11/2)	1300.94	$11/2^-$		
1445.9 *3*	3.0 *5*	4368.10	(19/2)	2922.12	$15/2^-$		
1456.2 *8*	2.2 *4*	5800.9	(23/2)	4344.3	(19/2)		
1520.5[#] *16*	1.3 *4*	7321.4		5800.9	(23/2)		
1556.5 *3*	1.9 *4*	5238.40	(21/2)	3681.81	(17/2)		
1592.2 *4*	1.3 *5*	2640.70	$(13/2^-)$	1048.58	$9/2^-$		
1621.1 *1*	54.7 *22*	2922.12	$15/2^-$	1300.94	$11/2^-$	Q	A_2=+0.19 *5*; A_4=−0.09 *6*
1657[#] *7*	0.3 *3*	7458?		5800.9	(23/2)		
1691.5 *5*	4.3 *10*	2740.84	(11/2)	1048.58	$9/2^-$		
1719.5 *9*	3.6 *5*	5987.2	(23/2)	4267.8	(19/2)		
1797.5[#] *6*	1.0 *4*	6784.6	(25/2)	4988.4	(21/2)		
1806.9[#] *7*	0.9 *5*	7607.9?		5800.9	(23/2)		
1866.5 *3*	1.1 *3*	6234.6	(23/2)	4368.10	(19/2)		
1890.8 *7*	4.9 *7*	3190.4	(13/2)	1300.94	$11/2^-$		
1908.5 *10*	2.8 *6*	7146.9	(25/2)	5238.40	(21/2)		
1948.9[#] *4*	0.8 *5*	7749.9?	(27/2)	5800.9	(23/2)		

[†] Mult=Q indicates ΔJ=2 transition; mult=D, ΔJ=1, dipole transition with possible quadrupole admixture.
[‡] Ordering of the 181-297 γ cascade is not established.
[#] Placement of transition in the level scheme is uncertain.

$^{13}C(^{48}Ca,pn\gamma)$ **2010St01**

Level Scheme

Intensities: Relative I_γ



$^{59}_{25}Mn_{34}$

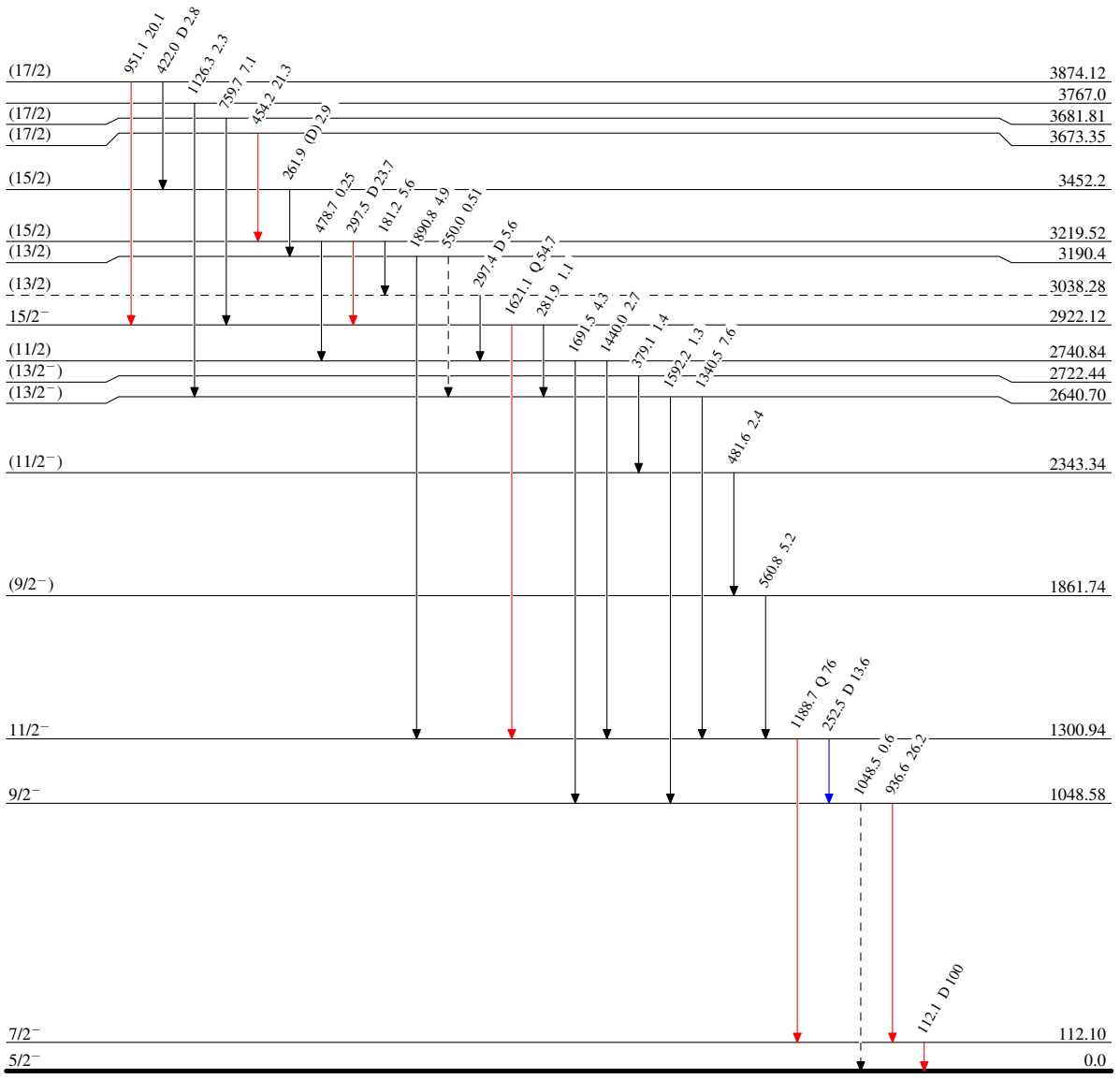
$^{13}C(^{48}Ca,pn\gamma)$ 2010St01

Level Scheme (continued)

Intensities: Relative I_γ

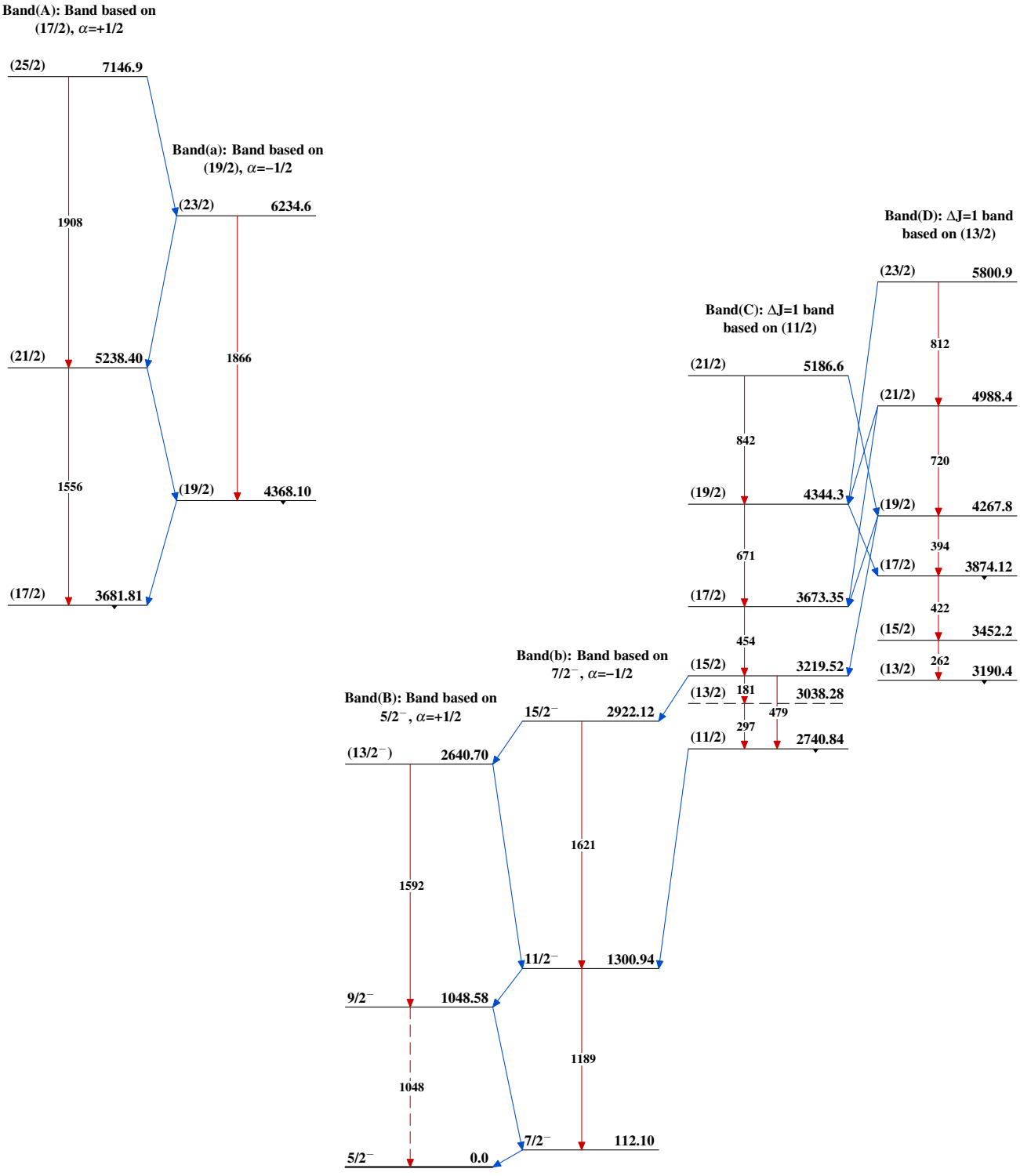
Legend

$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$
γ Decay (Uncertain)



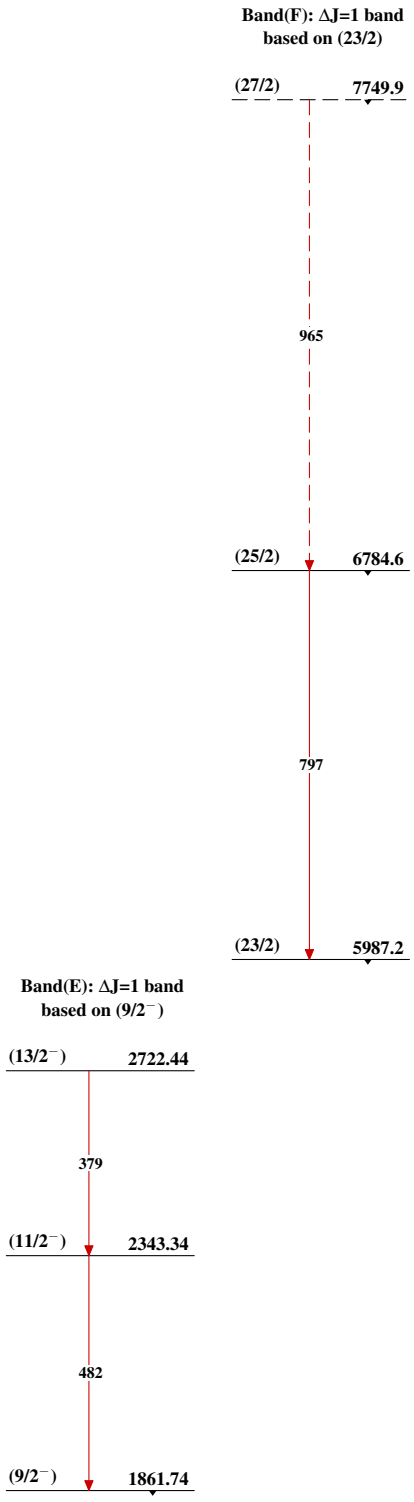
$^{59}_{25}Mn_{34}$

$^{13}C(^{48}Ca,pn\gamma)$ 2010St01



$^{59}_{25}Mn_{34}$

$^{13}C(^{48}Ca,pn\gamma)$ 2010St01 (continued)



$^{59}_{25}Mn_{34}$