$^{14}C(^{48}Ca,pn\gamma)$ 2010St01

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. Browne, J. K. Tuli	NDS 114, 1849 (2013)	31-Dec-2012

Includes $^{13}C(^{48}Ca,p\gamma)$ reaction.

E=130 MeV ^{48}Ca beam in 11^+ charge state provided by ATLAS facility at Argonne. Measured Eγ, Iγ, $\gamma\gamma$ coin, and $\gamma(\theta)$ using GAMMASPHERE array of 91 and 100 Compton-suppressed HPGe detectors in two different experiments. Enriched ^{13}C and ^{14}C targets. Detected charged ions with the Fragment Mass Analyzer. Comparisons with shell-model calculations using GXPF1A interaction in full *fp* space.

^{60}Mn Levels

E(level)[†]	J^{π}[‡]	$T_{1/2}$	Comments
0.0	1^+		
271.21 *24*	4^+	1.77 s *2*	$T_{1/2}$: from Adopted Levels, Gammas.
347.43 *17*	(2^+)		
407.17 *17*	(3^+)		
725.82 *25*	(5^+)		
733.33 *24*	(4)		
756.87 *20*			
835.90 *25*	(5)		
841.4 *3*			
965.4[#] *3*	(6)		
1089.9 *3*	(6^+)		
1214.6[@] *3*	(7)		
1245.4 *4*			
1783.8[#] *3*	(8)		
2048.8 *4*	(7^+)		
2222.7[&] *4*	(6)		
2381.5[@] *3*	(9)		
2438.5 *4*			
2568.9[a] *4*	(7)		
3005.0[&] *3*	(8)		
3047.0[#] *3*	(10)		
3485.4[a] *3*	(9)		
3601.0 *4*			
3653.4 *5*			
4022.1[&] *3*	(10)		
4058.7[@] *4*	(11)		
4131.4 *5*			
4388.3 *5*			
4532.0 *4*			
4612.2[a] *4*	(11)		
4644.2 *5*			
4780.7[#] *4*	(12)		
5001.1 *5*			
5074.9 *9*			
5234.1 *4*			
5261.1[&] *4*	(12)		
5985.0 *13*			
6026.2[a] *4*	(13)		
6107.4[@] *5*	(13)		
6234.3 *5*			

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$^{14}C(^{48}Ca,pn\gamma)$ 2010St01 (continued)

^{60}Mn Levels (continued)

E(level)[†]	J^{π}[‡]
6823.6[#] 5	(14)
6862.9[&] 4	(14)
7757.5[a] 4	(15)
8982.1[&] 9	(16)
9235[#] 3	(16)

[†] Deduced by evaluators from least-squares fit to γ-ray energies.
[‡] From γ-ray multipolarities supported by DCO ratios and rotational structure.
[#] Band(A): Band based on J=(6),signature α=0.
[@] Band(a): Band based on J=(7),signature α=1.
[&] Band(B): Band based on J=(6),signature α=0.
[a] Band(b): Band based on J=(7),signature α=1.

$\gamma(^{60}Mn)$

E_γ	I_γ	E_i(level)	J^π_i	E_f	J^π_f	Mult.[†]	Comments
59.9 2	2.3 6	407.17	(3+)	347.43	(2+)		
102.5 1	18.7 10	835.90	(5)	733.33	(4)	D	DCO=0.9 3; A_2=−0.18 7
129.5 1	80 3	965.4	(6)	835.90	(5)	D	DCO=1.2 2; A_2=−0.18 2
135.8 2	1.3 6	407.17	(3+)	271.21	4+	(D)	A_2<0
239.6 1	14.7 5	965.4	(6)	725.82	(5+)	D	DCO=0.9 3; A_2=−0.06 5
249.2 1	100 3	1214.6	(7)	965.4	(6)	D	A_2=−0.09 2
325.8 3	0.96 15	733.33	(4)	407.17	(3+)		
346.2[#] 10	0.34 11	2568.9	(7)	2222.7	(6)		
347.6 2	5.7 4	347.43	(2+)	0.0	1+		
349.7 1	0.63 22	756.87		407.17	(3+)		
364.0 1	11.2 5	1089.9	(6+)	725.82	(5+)	(D)	A_2=+0.24 8
389.6 3	2.3 3	2438.5		2048.8	(7+)		
407.0 2	4.2 14	407.17	(3+)	0.0	1+	(Q)	A_2>0
434.2 2	5.0 5	841.4		407.17	(3+)		
436.1 1	0.93 22	3005.0	(8)	2568.9	(7)		
454.6 1	44.0 16	725.82	(5+)	271.21	4+	(D)	DCO=1.6 5; A_2=+0.15 4
462.1 1	28.6 11	733.33	(4)	271.21	4+	(D)[‡]	DCO=1.3 3; A_2=+0.22 4
480.4 2	7.5 6	3485.4	(9)	3005.0	(8)		
512.8 1	3.0 3	4644.2		4131.4			
519.6 3	4.0 6	1245.4		725.82	(5+)		
536.6 1	13.9 8	4022.1	(10)	3485.4	(9)		
554.0 1	2.1 3	3601.0		3047.0	(10)		
565.0 2	72 3	835.90	(5)	271.21	4+	D	DCO=1.0 1; A_2=−0.04 3 A_2 and DCO for unresolved 565.0+569.1 doublet.
566.5 1	2.9 4	3005.0	(8)	2438.5			
569.1 2	79 3	1783.8	(8)	1214.6	(7)	D	DCO=1.0 1; A_2=−0.04 3 A_2 and DCO for unresolved 565.0+569.1 doublet.
590.0 1	15.5 8	4612.2	(11)	4022.1	(10)	(D)	A_2<0
597.6 2	59 2	2381.5	(9)	1783.8	(8)	D	DCO=1.1 2; A_2=−0.06 3
648.9 1	10.7 6	5261.1	(12)	4612.2	(11)		
665.5 1	37.8 13	3047.0	(10)	2381.5	(9)	D	DCO=1.0 3; A_2=−0.07 4
702.0 1	0.87 22	5234.1		4532.0			
716.0 3	1.2 3	6823.6	(14)	6107.4	(13)		
722.0 2	10.7 5	4780.7	(12)	4058.7	(11)		

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$^{14}C(^{48}Ca,pn\gamma)$ 2010St01 (continued)

$\gamma(^{60}Mn)$ (continued)

E_γ	I_γ	E_i(level)	J^π_i	E_f	J^π_f	Mult.†	Comments
765.1 *1*	7.2 *5*	6026.2	(13)	5261.1	(12)		
782.2 *2*	2.0 *3*	3005.0	(8)	2222.7	(6)		
818.4 *2*	0.6 *5*	1783.8	(8)	965.4	(6)		
818.7 *9*	13.5 *19*	1089.9	(6^+)	271.21	4^+		
836.7 *1*	4.2 *4*	6862.9	(14)	6026.2	(13)		
894.6 *1*	3.2 *4*	7757.5	(15)	6862.9	(14)		
916.5 *15*	1.1 *3*	3485.4	(9)	2568.9	(7)		
931.0 *1*	1.2 *3*	4532.0		3601.0			
956.1 *3*	3.8 *6*	3005.0	(8)	2048.8	(7^+)		$A_2>0$ A_2 for unresolved 958.1+956.1 doublet.
958.1 *5*	4.0 *6*	2048.8	(7^+)	1089.9	(6^+)		$A_2>0$ A_2 for unresolved 958.1+956.1 doublet.
1011.6 *1*	17.7 *8*	4058.7	(11)	3047.0	(10)	D	DCO=1.4 *5*; A_2=−0.16 *8*
1016.9 *2*	2.3 *5*	4022.1	(10)	3005.0	(8)		
1046.9 *2*	1.9 *3*	3485.4	(9)	2438.5			
1127.2 *3*	4.3 *7*	4612.2	(11)	3485.4	(9)		
1132.7 *3*	2.1 *9*	2222.7	(6)	1089.9	(6^+)		
1167.2 *2*	12.8 *7*	2381.5	(9)	1214.6	(7)	Q	DCO=1.7 *8*; A_2=+0.46 *10*; A_4=−0.24 *12*
1193.5 *9*	3.7 *4*	2438.5		1245.4			
1239.0 *3*	4.5 *6*	5261.1	(12)	4022.1	(10)	(Q)	$A_2>0$
1263.4 *4*	6.7 *5*	3047.0	(10)	1783.8	(8)	Q	A_2=+0.34 *9*; A_4=−0.23 *11*
1323.8 *7*	8.1 *10*	2048.8	(7^+)	725.82	(5^+)	Q	A_2=+0.47 *12*
1326.6 *2*	1.4 *4*	6107.4	(13)	4780.7	(12)		
1414.0 *4*	2.3 *6*	6026.2	(13)	4612.2	(11)		
1436.9 *6*	3.6 *6*	3485.4	(9)	2048.8	(7^+)		
1453.6 *2*	1.9 *4*	6234.3		4780.7	(12)		
1479.1 *9*	8.8 *13*	2568.9	(7)	1089.9	(6^+)		
1565.2 *3*	0.8 *3*	4612.2	(11)	3047.0	(10)		
1601.9 *5*	4.7 *7*	6862.9	(14)	5261.1	(12)		
1640.7 *3*	2.3 *3*	4022.1	(10)	2381.5	(9)		
1676.8 *5*	8.4 *6*	4058.7	(11)	2381.5	(9)	Q	A_2=+0.35 *13*
1701.6 *3*	2.2 *3*	3485.4	(9)	1783.8	(8)		
1731.3 *6*	2.8 *9*	7757.5	(15)	6026.2	(13)		
1734.2 *6*	6.6 *7*	4780.7	(12)	3047.0	(10)		
1749.8 *4*	3.3 *6*	4131.4		2381.5	(9)		
1790.4 *23*	1.9 *4*	3005.0	(8)	1214.6	(7)		
1869.6 *4*	0.6 *5*	3653.4		1783.8	(8)		
1926.3 *12*	4.0 *6*	5985.0		4058.7	(11)		
1954.0 *4*	1.9 *5*	5001.1		3047.0	(10)		
2006.7 *4*	0.7 *5*	4388.3		2381.5	(9)		
2045.8 *13*	7.4 *15*	6823.6	(14)	4780.7	(12)	(Q)	$A_2>0$ A_2 for 2045.8+2050 unresolved doublet.
2050 *3*	3.1 *15*	6107.4	(13)	4058.7	(11)	(Q)	$A_2>0$ A_2 for unresolved 2045.8+2050 doublet.
2119.2 *8*	3.5 *10*	8982.1	(16)	6862.9	(14)		
2411 *3*	2.2 *6*	9235	(16)	6823.6	(14)		
2693.3 *8*	2.2 *7*	5074.9		2381.5	(9)		

† Mult=Q indicates ΔJ=2 transition; mult=d, ΔJ=1, dipole transition with possible quadrupole admixture. The DCO ratios given are with gate set on 249γ dipole transition.

‡ ΔJ=(0) dipole transition.

Placement of transition in the level scheme is uncertain.

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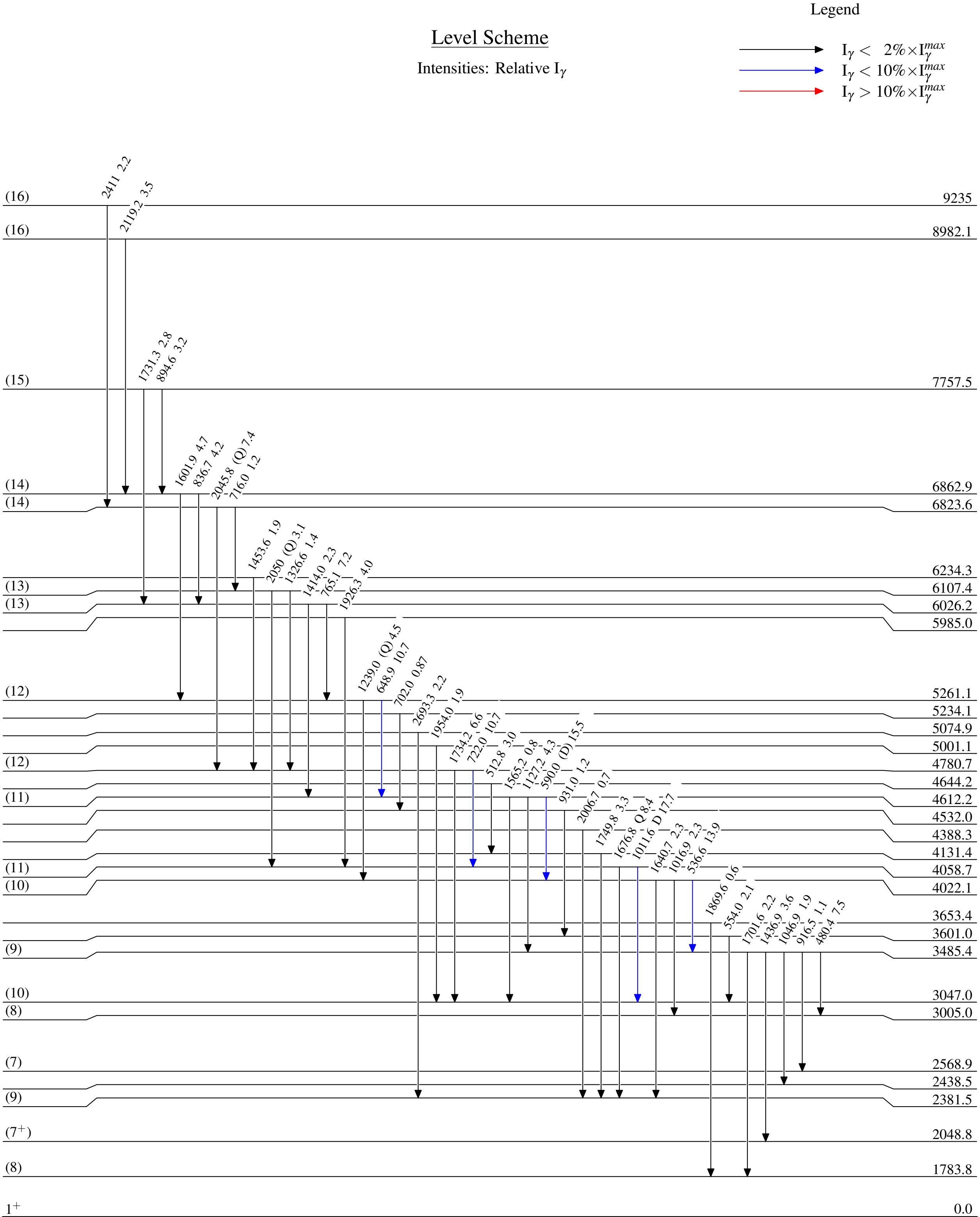
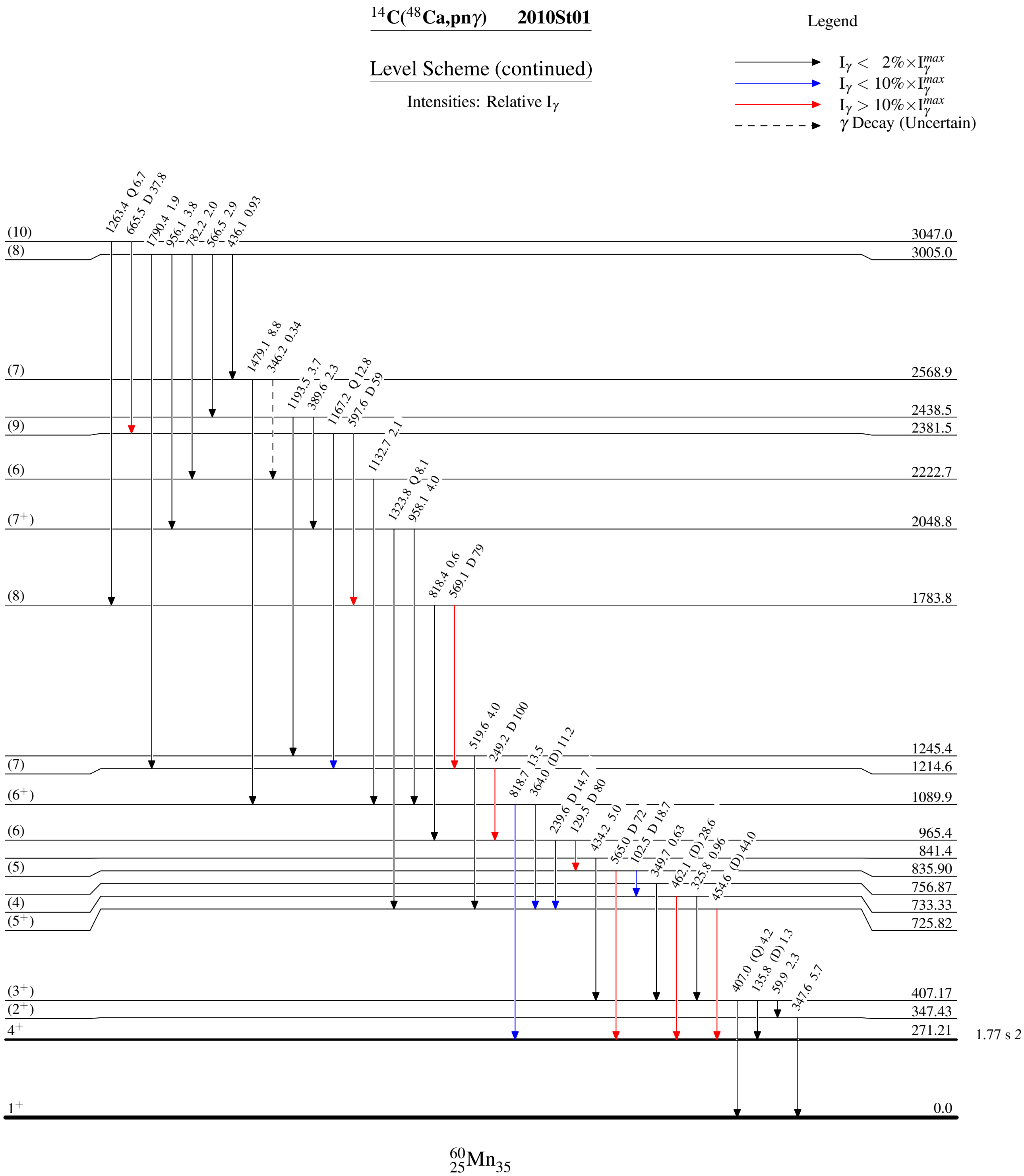
Level Scheme

Intensities: Relative I_γ

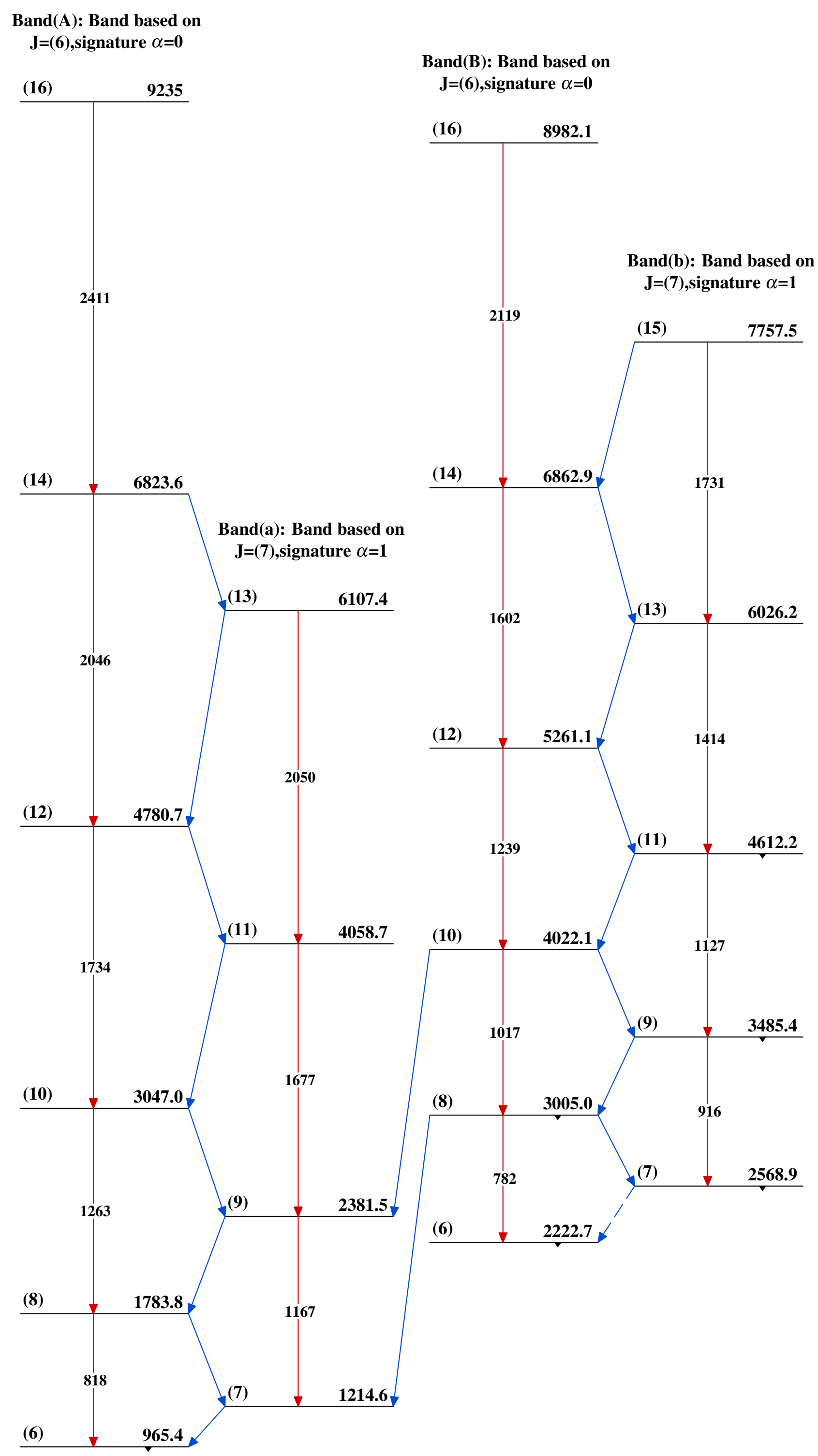


$^{60}_{25}Mn_{35}$



$^{14}C(^{48}Ca,pn\gamma)$ 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)
(10) 3047.0
(8) 3005.0
(7) 2568.9
2438.5
(9) 2381.5
(6) 2222.7
(7+) 2048.8
(8) 1783.8
1245.4
(7) 1214.6
(6+) 1089.9
(6) 965.4
841.4
(5) 835.90
756.87
(4) 733.33
(5+) 725.82
(3+) 407.17
(2+) 347.43
4+ 271.21 1.77 s 2
1+ 0.0
1263.4 Q 6.7
665.5 D 37.8
1790.4 1.9
956.1 3.8
782.2 2.0
566.5 2.9
436.1 0.93
1479.1 8.8
346.2 0.34
1193.5 3.7
389.6 2.3
1167.2 Q 12.8
597.6 D 59
1132.7 2.1
1323.8 Q 8.1
958.1 4.0
818.4 0.6
569.1 D 79
519.6 4.0
249.2 D 100
818.7 13.5
364.0 (D) 11.2
239.6 D 14.7
129.5 D 80
434.2 5.0
565.0 D 72
102.5 D 18.7
349.7 0.63
462.1 (D) 28.6
325.8 0.96
454.6 (D) 44.0
407.0 (Q) 4.2
135.8 (D) 1.3
59.9 2.3
347.6 5.7
$^{60}_{25}Mn_{35}$

$^{14}C(^{48}Ca,pn\gamma)$ 2010St01



$^{60}_{25}Mn_{35}$