Adopted Levels, Gammas

History

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

Q(β^-)=5139.5 *24*; S(n)=7769 *4*; S(p)=10822.5 *28*; Q(α)=−8806 *95* 2017Wa10
Production: ^{48}Ca(^{13}C,pn) E=26 MeV (1977Pa18), ^{64}Ni(^{3}He,^{8}B), E(^{3}He)=73.8 MeV (1976Ka24).
Identification: γ rays from decay following ^{48}Ca(^{13}C,pn) compared with γ rays from ^{58}Fe(d,pγ) (1977Pa18).
^{64}Ni(^{238}U,Xγ), 6.5 MeV/nucleon (2017Kl01): measured mean lifetime of 11/2$^-$ state at 1300 keV.

^{59}Mn Levels

Cross Reference (XREF) Flags

A	^{59}Cr β^- decay	D	^{64}Ni(^{3}He,^{8}B)
B	^{13}C(^{48}Ca,pnγ)	E	^{238}U(^{70}Zn,Xγ)
C	^{59}Co(π^-,π^+)		

E(level)[d]	J$^\pi$[e]	T$_{1/2}$	XREF	Comments
0.0[#]	5/2$^-$	4.59 s *5*	AB D	%β^-=100 Q=+0.34 *4*; μ=+3.496 *3* (2016Ba44) δ<r^2>(^{55}Mn,^{59}Mn)=+0.316 fm^2 *10(stat) 37(syst)* (atomic), and +0.297 fm^2 *21(stat) 37(syst)* (ionic) (2016He14). J$^\pi$: 5/2 from analysis of hyperfine structure (2015Ba49). Allowed β^- decay to 3/2$^-$ and 5/2$^-$ levels in ^{59}Fe. T$_{1/2}$: From B(t) (2001Oi02). Other: 4.6 s *1* from composite decay curve for 287γ, 473γ, 571γ, 591γ, and 726γ in ^{59}Mn β^- decay (1977Pa18). μ,Q: from 2016Ba44 (collinear laser spectroscopy). Other: μ=+3.493 *2* (2015Ba49 − same research group of 2016Ba44).
112.10[@] *10*	7/2$^-$		AB E	J$^\pi$: 112.1γ D to 5/2$^-$.
1048.71[#] *14*	9/2$^-$		B E	J$^\pi$: 936.6γ to 7/2$^-$; band assignment.
1238.3 *6*			A	
1300.81[@] *14*	11/2$^-$	1.82 ps *28*	B E	J$^\pi$: 252.1γ M1 to 9/2$^-$, 1188.7γ E2 to 7/2$^-$. T$_{1/2}$: from measured mean lifetime τ=2.63 ps *40* using RDDS method (2017Kl01).
1861.61[b] *17*	(9/2$^-$)		B	
1900.2 *8*			A	
2343.21[b] *20*	(11/2$^-$)		B	
2640.64[#] *25*	(13/2$^-$)		B	
2722.31[b] *22*	(13/2$^-$)		B	
2740.75[&] *21*	(11/2)		B	
2922.00[@] *17*	15/2$^-$		B E	J$^\pi$: 1621.1γ Q to 11/2$^-$.
3038.18?[&] *21*	(13/2)		B	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. J$^\pi$: 297.4γ D to (11/2).
3190.2[a] *4*	(13/2)		B	
3219.41[&] *19*	(15/2)		B	J$^\pi$: 297.5γ D to 15/2$^-$, γ to (11/2), band assignment.
3452.1[a] *3*	(15/2)		B	J$^\pi$: 261.9γ (D) to (13/2).
3673.23[&] *25*	(17/2)		B	
3681.70[†] *19*	(17/2)		B	
3767.0 *4*			B	
3874.0[a] *3*	(17/2)		B	J$^\pi$: 422.0γ D to (15/2).
4267.6[a] *3*	(19/2)		B	J$^\pi$: 393.6γ D to (17/2).
4344.2[&] *3*	(19/2)		B	

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Adopted Levels, Gammas (continued)

^{59}Mn Levels (continued)

E(level)[d]	Jπ[e]	$T_{1/2}$	XREF	Comments
4367.99‡ *21*	(19/2)		B	
4988.3[a] *3*	(21/2)		B	
5186.5& *4*	(21/2)		B	
5238.28† *25*	(21/2)		B	
5800.8[a] *4*	(23/2)		B	
5987.2[c] *10*	(23/2)		B	
6234.5‡ *3*	(23/2)		B	
6681.8 *3*			B	
6784.6[c] *10*	(25/2)		B	
7146.8† *4*	(25/2)		B	
7321.4 *17*			B	
7458? *7*			B	
7607.9? *8*			B	
7749.9?[c] *5*	(27/2)		B	
7758.3 *11*			B	
27.2×10^3 *5*		9.2 MeV *14*	C	Double giant dipole resonance (double GDR); not a discrete level. E(level): from ^{59}Co(π^-,π^+). Γ from (π^-,π^+).

† 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.
@ Band(b): Band based on 7/2$^-$, α=−1/2.
& Band(C): ΔJ=1 band based on (11/2).
[a] Band(D): ΔJ=1 band based on (13/2).
[b] Band(E): ΔJ=1 band based on (9/2$^-$).
[c] Band(F): ΔJ=1 band based on (23/2).
[d] From least-squares fit to γ-ray energies.
[e] From band assignments. Additional arguments, if any, listed as comments.

γ(^{59}Mn)

E_i(level)	J_i^π	E_γ†	I_γ†	E_f	J_f^π	Mult.†	α@	Comments
112.10	7/2$^-$	112.1 *1*	100	0.0	5/2$^-$	D		
1048.71	9/2$^-$	936.6 *1*	100 *5*	112.10	7/2$^-$			
		1048.5& *4*	2.3 *19*	0.0	5/2$^-$			
1238.3		1126.5‡	6‡	112.10	7/2$^-$			E_γ: Placement from ^{59}Cr β^- decay. A comparable 1126.3 keV *3* γ is placed from 3767 keV level in (^{48}Ca,pnγ). However, 1238 keV level is not reported in (^{48}Ca,pnγ) 2010St01 and did not observe 1238γ.
		1238.6‡ *9*	100‡ *11*	0.0	5/2$^-$			
1300.81	11/2$^-$	252.1 *2*	18 *7*	1048.71	9/2$^-$	M1	0.00290	α(K)=0.00261 *4*; α(L)=0.000249 *4*; α(M)=3.39×10^{-5} *5* α(N)=1.615×10^{-6} *23* B(M1)(W.u.)=0.12 *5* E_γ: Weighted average of 252.5 *1* (^{48}Ca,pnγ)

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Adopted Levels, Gammas (continued)

γ(^{59}Mn) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[†]	α[@]	Comments
								and 251.6 *3* (^{70}Zn,Xγ).
								Mult.: From (^{48}Ca,pnγ) and RUL.
1300.81	11/2$^-$	1188.7 *1*	100 *4*	112.10	7/2$^-$	E2	1.24×10^{-4}	α(K)=0.0001055 *15*; α(L)=9.90×10^{-6} *14*; α(M)=1.344×10^{-6} *19* α(N)=6.47×10^{-8} *9*; α(IPF)=7.45×10^{-6} *11* B(E2)(W.u.)=8.1 *14* Mult.: From (^{48}Ca,pnγ) and RUL.
1861.61	(9/2$^-$)	560.8 *1*	100	1300.81	11/2$^-$			
1900.2		662.6[‡]	40[‡]	1238.3				
		1899.5[‡]	100[‡]	0.0	5/2$^-$			
2343.21	(11/2$^-$)	481.6 *1*	100	1861.61	(9/2$^-$)			
2640.64	(13/2$^-$)	1340.5 *4*	100 *9*	1300.81	11/2$^-$			
		1592.2 *4*	17 *7*	1048.71	9/2$^-$			
2722.31	(13/2$^-$)	379.1 *1*	100	2343.21	(11/2$^-$)			
2740.75	(11/2)	1440.0 *10*	63 *19*	1300.81	11/2$^-$			
		1691.5 *5*	100 *23*	1048.71	9/2$^-$			
2922.00	15/2$^-$	281.9 *3*	2.0 *4*	2640.64	(13/2$^-$)			
		1621.1 *1*	100 *4*	1300.81	11/2$^-$	Q		
3038.18?	(13/2)	297.4[#] *1*	100	2740.75	(11/2)	D		
3190.2	(13/2)	550.0[&] *10*	10 *4*	2640.64	(13/2$^-$)			
		1890.8 *7*	100 *14*	1300.81	11/2$^-$			
3219.41	(15/2)	181.2[#] *1*	23.6 *13*	3038.18?	(13/2)			
		297.5 *1*	100 *4*	2922.00	15/2$^-$	D		
		478.7 *2*	1.1 *9*	2740.75	(11/2)			
3452.1	(15/2)	261.9 *1*	100	3190.2	(13/2)	(D)		
3673.23	(17/2)	454.2 *2*	100	3219.41	(15/2)			
3681.70	(17/2)	759.7 *1*	100	2922.00	15/2$^-$			
3767.0		1126.3 *3*	100	2640.64	(13/2$^-$)			
3874.0	(17/2)	422.0 *2*	13.9 *10*	3452.1	(15/2)	D		
		951.1 *3*	100 *5*	2922.00	15/2$^-$			
4267.6	(19/2)	393.6 *1*	100 *4*	3874.0	(17/2)	D		
		594.5 *3*	29.7 *16*	3673.23	(17/2)			
		1047.4 *6*	11.9 *16*	3219.41	(15/2)			
4344.2	(19/2)	470.0 *2*	23 *4*	3874.0	(17/2)			
		671.2 *2*	100 *5*	3673.23	(17/2)			
4367.99	(19/2)	686.3 *1*	100 *9*	3681.70	(17/2)			
		1445.9 *3*	67 *11*	2922.00	15/2$^-$			
4988.3	(21/2)	644.5 *3*	5.8 *22*	4344.2	(19/2)			
		720.5 *2*	100 *5*	4267.6	(19/2)			
		1315.3 *4*	39 *4*	3673.23	(17/2)			
5186.5	(21/2)	842.3 *6*	100 *20*	4344.2	(19/2)			
		918.8 *2*	67 *20*	4267.6	(19/2)			
5238.28	(21/2)	870.3 *2*	100 *10*	4367.99	(19/2)			
		1556.5 *3*	49 *10*	3681.70	(17/2)			
5800.8	(23/2)	812.5 *2*	100 *7*	4988.3	(21/2)			
		1456.2 *8*	38 *7*	4344.2	(19/2)			
5987.2	(23/2)	1719.5 *9*	100	4267.6	(19/2)			
6234.5	(23/2)	996.2 *1*	100 *19*	5238.28	(21/2)			
		1866.5 *3*	42 *12*	4367.99	(19/2)			
6681.8		447.3 *1*	100	6234.5	(23/2)			
6784.6	(25/2)	797.4 *2*	100 *29*	5987.2	(23/2)			
		1797.5[&] *6*	71 *29*	4988.3	(21/2)			
7146.8	(25/2)	912.3 *2*	71 *14*	6234.5	(23/2)			
		1908.5 *10*	100 *21*	5238.28	(21/2)			

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Adopted Levels, Gammas (continued)

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

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π
7321.4		1520.5& *16*	100	5800.8	(23/2)
7458?		1657& *7*	100	5800.8	(23/2)
7607.9?		1806.9& *7*	100	5800.8	(23/2)
7749.9?	(27/2)	965.4& *10*	38 *28*	6784.6	(25/2)
		1948.9& *4*	100 *63*	5800.8	(23/2)
7758.3		611.5 *10*	100	7146.8	(25/2)

† From (^{48}Ca,pnγ), except otherwise noted.
‡ From ^{59}Cr β^- decay.
# Ordering of the 181-297 γ cascade is not established.
@ Additional information 1.
& Placement of transition in the level scheme is uncertain.

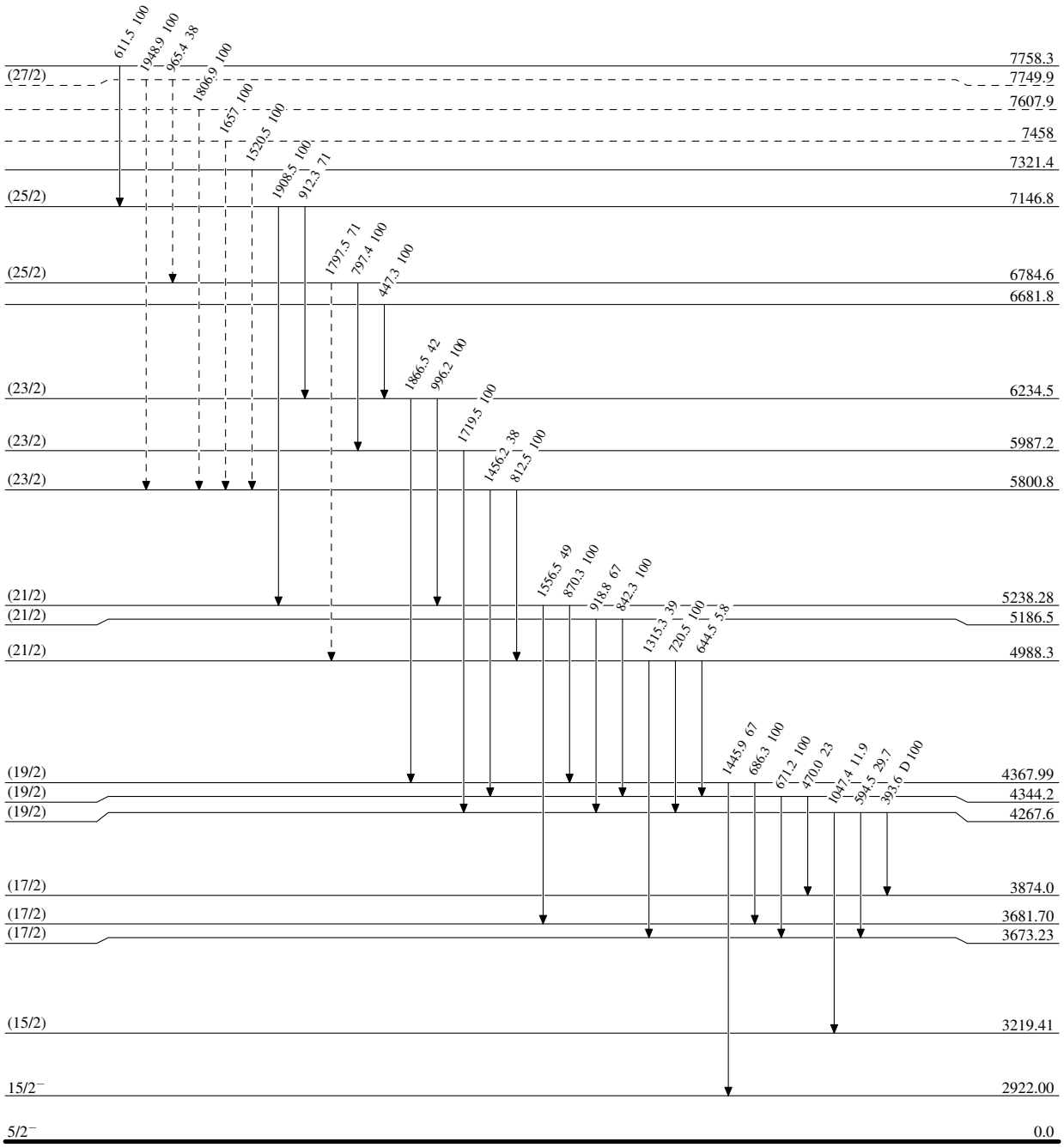
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

γ Decay (Uncertain)



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

Adopted Levels, Gammas

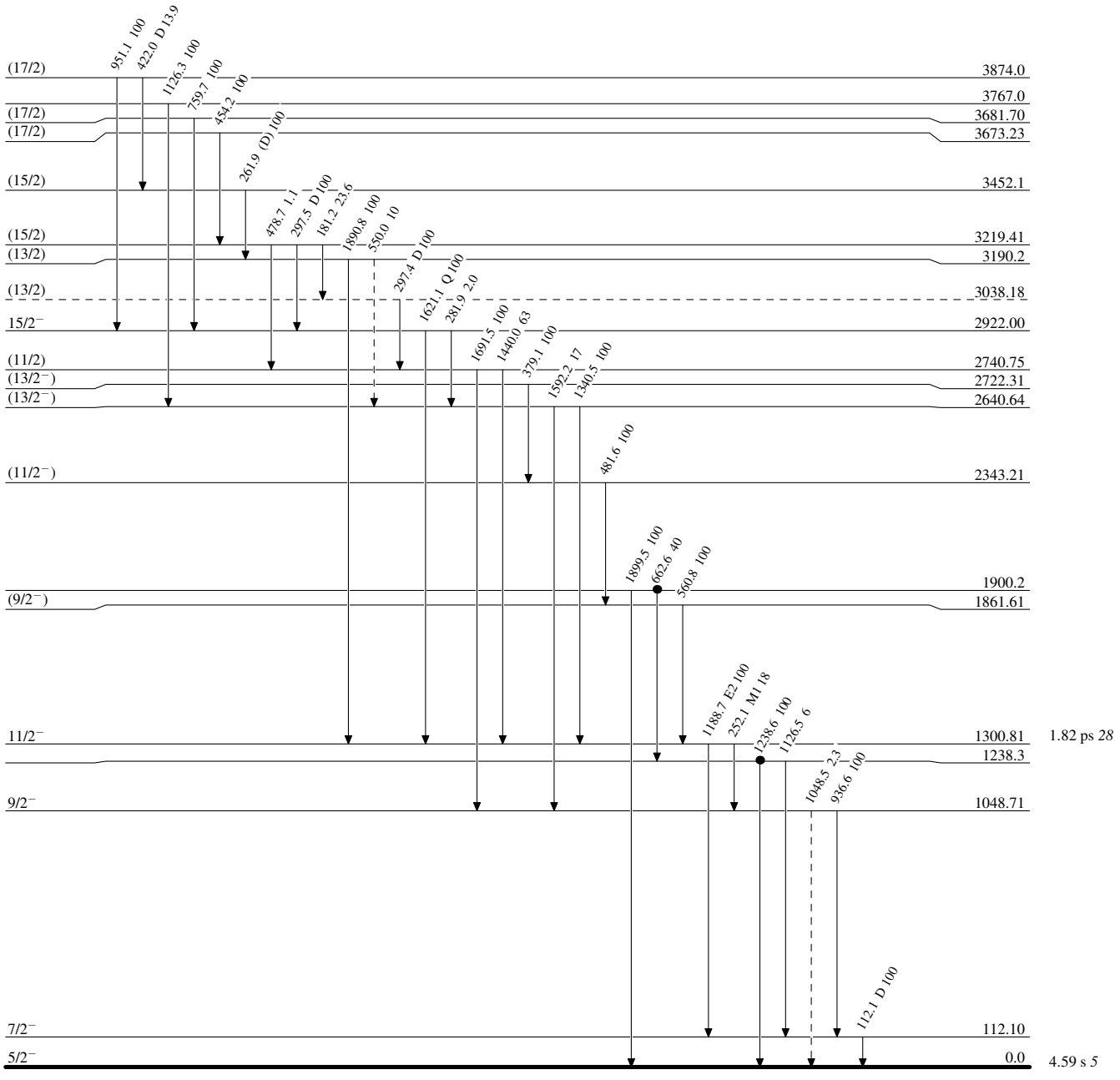
Level Scheme (continued)

Intensities: Relative photon branching from each level

Legend

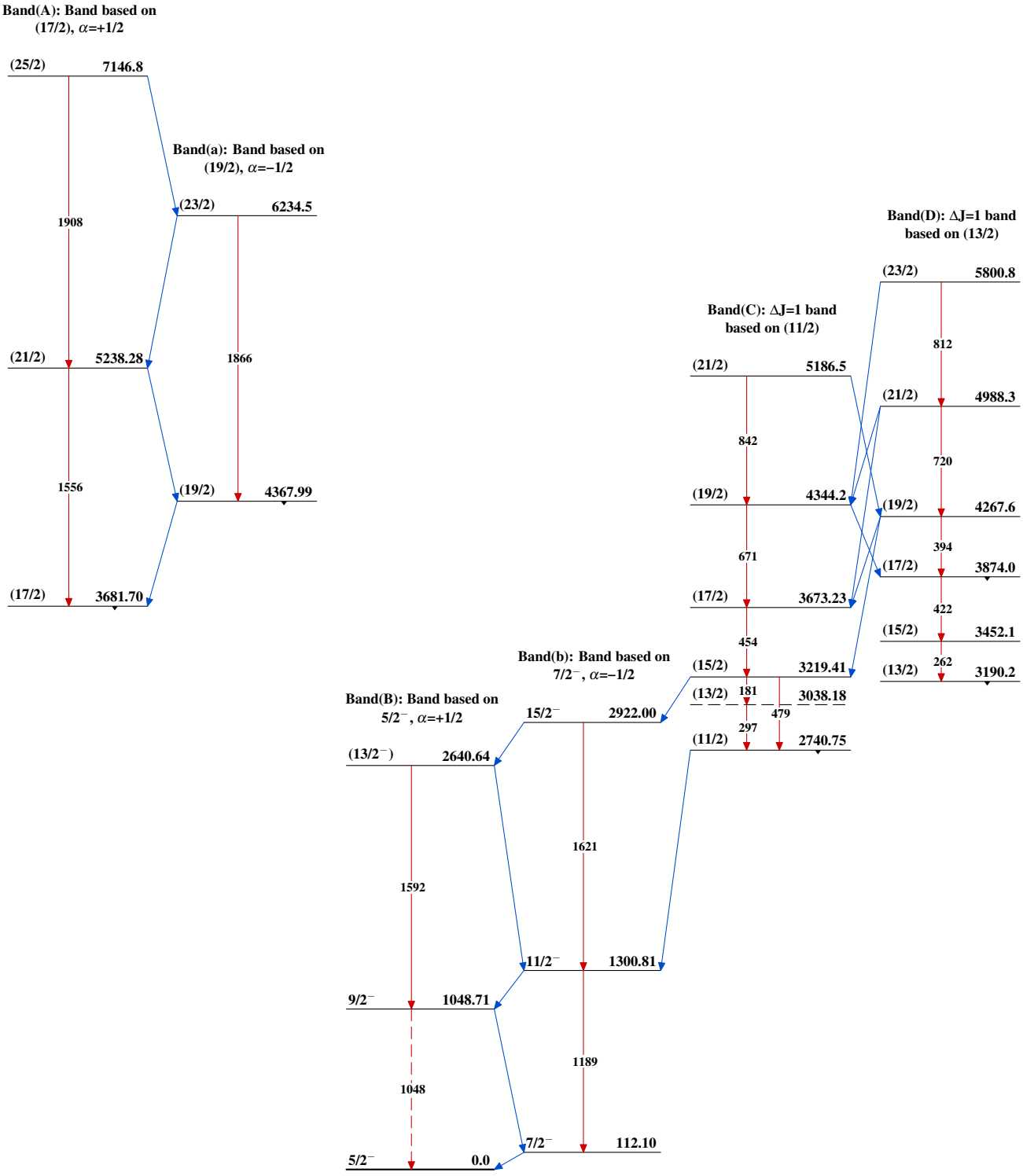
- - - - - - ► γ Decay (Uncertain)

● Coincidence



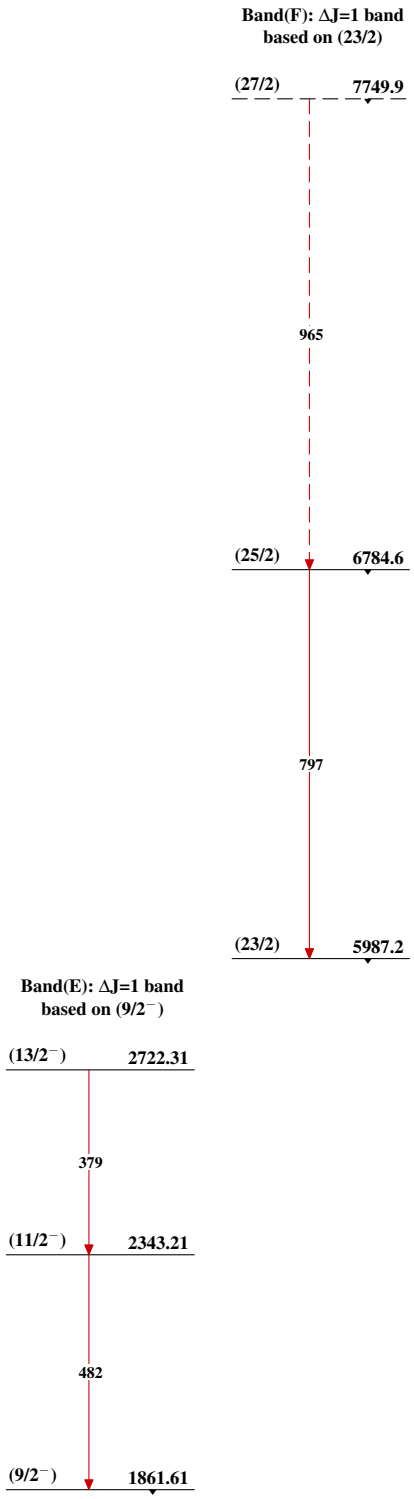
$^{59}_{25}Mn_{34}$

Adopted Levels, Gammas



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

Adopted Levels, Gammas (continued)



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