^{58}Ni(^{30}Si,α2pnγ) 1996Sm07

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. Shamsuzzoha Basunia	NDS 199,271 (2025)	1-Sep-2024

Additional information 1.

1996Sm07: ^{58}Ni(^{30}Si,α2pnγ), E=134 MeV; EUROGAM phase 2 array (30 coaxial Ge and 24 Clover detectors, all BGO shielded); measured Eγ, Iγ, 2-fold and higher γ coin, DCO ratios.

^{81}Sr Levels

E(level)[†]	J$^\pi$[‡]	Comments
0[j]	1/2$^-$	J$^\pi$: from Adopted Levels.
79.20 *4*	(5/2)$^-$	E(level),J$^\pi$: from Adopted Levels.
89	(7/2$^+$)	J$^\pi$: from Adopted Levels.
118.3[f]	1/2$^+$	
132[d]	9/2$^+$	
154.3[i]	3/2$^-$	
219.3[e]	3/2$^+$	
334.3[f]	5/2$^+$	
365.2[h]	7/2$^-$	
378.7[j]	5/2$^-$	
555.7[e]	7/2$^+$	
631.2[i]	7/2$^-$	
705.2[g]	9/2$^-$	
793.8[f]	9/2$^+$	
811.0[c]	11/2$^+$	
903.7[d]	13/2$^+$	
998.4[j]	9/2$^-$	
1053.5[h]	11/2$^-$	
1106.0[e]	11/2$^+$	
1330.6[i]	11/2$^-$	
1467.0[f]	13/2$^+$	
1503.2[g]	13/2$^-$	
1737.8[c]	15/2$^+$	
1802.8[j]	13/2$^-$	
1858.2[e]	15/2$^+$	
1863.7[d]	17/2$^+$	
1908.0[h]	15/2$^-$	
2210.1[i]	15/2$^-$	
2321.4[f]	17/2$^+$	
2445.5[g]	17/2$^-$	
2738.3[j]	17/2$^-$	
2787.3[e]	19/2$^+$	
2901.8[h]	19/2$^-$	
2960.4[d]	21/2$^+$	
3142.7[i]	19/2$^-$	
3327.2[f]	21/2$^+$	
3404.2	21/2$^+$	
3493.2[g]	21/2$^-$	
3710.4[b]	23/2$^+$	

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^{58}Ni(^{30}Si,α2pnγ) 1996Sm07 (continued)

^{81}Sr Levels (continued)

E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡
3798.3?[j]	(21/2$^-$)	5170.4[#]	27/2$^+$	7132.6	(33/2$^+$)	10390.7[@]	43/2$^-$
3855.2?	(23/2$^-$)	5238.4[d]	29/2$^+$	7181.1[f]	33/2$^+$	10479.4[f]	41/2$^+$
3883.3[e]	23/2$^+$	5246.0[i]	27/2$^-$	7396.3[@]	35/2$^-$	10826.0[&]	(43/2$^-$)
3975.3[&]	23/2$^-$	5261.8?[h]	(27/2$^-$)	7445.1[b]	35/2$^+$	11253.7[d]	45/2$^+$
4041.9?	(23/2$^-$)	5705.2[a]	29/2$^-$	7639.2?[g]	(33/2$^-$)	11618.6[a]	45/2$^-$
4056.8?[h]	(23/2$^-$)	5749.6[f]	29/2$^+$	7757.3[&]	35/2$^-$	12109.5[@]	47/2$^-$
4103.6[d]	25/2$^+$	5998.3[b]	31/2$^+$	7857.1[d]	37/2$^+$	12372.4?[f]	(45/2$^+$)
4141.0[i]	23/2$^-$	6111.5?[g]	(29/2$^-$)	8405.5[a]	37/2$^-$	12519.3[&]	(47/2$^-$)
4470.3[f]	25/2$^+$	6129.8[@]	31/2$^-$	8670.6?	(37/2$^+$)	13424.0?[d]	(49/2$^+$)
4550.1[a]	25/2$^-$	6261.6	31/2$^+$	8768.4[f]	37/2$^+$	13491.7[a]	(49/2$^-$)
4727.3?[g]	(25/2$^-$)	6355.4[&]	31/2$^-$	8816.9[@]	39/2$^-$	14005.4[@]	51/2$^-$
4749.2[b]	27/2$^+$	6480.3[d]	33/2$^+$	9245.4[&]	39/2$^-$	15582.6[a]	(53/2$^-$)
4996.0[@]	27/2$^-$	6517.8?[h]	(31/2$^-$)	9310.6?[g]	(37/2$^-$)	16171.5[@]	(55/2$^-$)
5080.4[e]	27/2$^+$	6788.6	(33/2$^+$)	9401.9[d]	41/2$^+$	18717.1[@]	(59/2$^-$)
5100.6[&]	27/2$^-$	6989.1[a]	33/2$^-$	9931.4[a]	41/2$^-$		

† Mean of authors′ values.
‡ Authors′ suggested values; based on deduced band structure and measured DCO ratios, except where otherwise noted.
# Level may be isomeric, based on sudden cut off for cascade Iγ above the 1287γ which deexcites this level (1996Sm07).
@ Band(A): Possible π=−, α=−1/2, 5-quasiparticle band. Feeds into 5/2[303] α=−1/2 band. No signature partner is observed. Postulated to contain the simultaneous alignment of a pair of quasineutrons and a pair of quasiprotons (1996Sm07), resulting in increased deformation.
& Band(b): α=−1/2, 3-quasiparticle Eab band. (ν 5/2[303]) + aligned pair of quasiprotons.
a Band(B): α=+1/2, 3−quasiparticle Fab band. (ν 5/2[303]) + aligned pair of quasiprotons.
b Band(C): α=−1/2 (ν 5/2[422])(π $g_{9/2}$)^2 band. Yrast following crossing of 1-quasineutron band at $\hbar\omega\approx$0.50 MeV.
c Band(d): (ν 5/2[422]), α=−1/2 decoupled yrast band.
d Band(D): (ν 5/2[422]), α=+1/2 decoupled yrast band.
e Band(e): (ν 1/2[431]), α=−1/2 band. Intruder state from $d_{5/2}$ subshell.
f Band(E): (ν 1/2[431]), α=+1/2 band. Intruder state from $d_{5/2}$ subshell.
g Band(F): (ν 5/2[303]), α=+1/2 band.
h Band(f): (ν 5/2[303]), α=−1/2 band.
i Band(g): (ν 1/2[301]), α=−1/2 band.
j Band(G): (ν 1/2[301]), α=+1/2 band.

γ(^{81}Sr)

E_γ†	E_i(level)	J^π_i	E_f	J^π_f	Comments
43	132	9/2$^+$	89	(7/2$^+$)	
(79.20 *4*)	79.20	(5/2)$^-$	0	1/2$^-$	E_γ: from Adopted Gammas.
100.7	219.3	3/2$^+$	118.3	1/2$^+$	
115.0	334.3	5/2$^+$	219.3	3/2$^+$	
118.3	118.3	1/2$^+$	0	1/2$^-$	
154.3	154.3	3/2$^-$	0	1/2$^-$	
216.3	334.3	5/2$^+$	118.3	1/2$^+$	
219.5	219.3	3/2$^+$	0	1/2$^-$	
221.4	555.7	7/2$^+$	334.3	5/2$^+$	
224.1	378.7	5/2$^-$	154.3	3/2$^-$	

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^{58}Ni(^{30}Si,α2pnγ) 1996Sm07 (continued)

$\gamma(^{81}Sr)$ (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	Comments
238.1		793.8	$9/2^+$	555.7	$7/2^+$		
253.3		631.2	$7/2^-$	378.7	$5/2^-$		
276.2	18.8 *4*	365.2	$7/2^-$	89	$(7/2^+)$		
286.6	12.5 *3*	365.2	$7/2^-$	79.20	$(5/2)^-$		
306.2	2.5 *2*	3710.4	$23/2^+$	3404.2	$21/2^+$		
311.9		1106.0	$11/2^+$	793.8	$9/2^+$		
333.2		1330.6	$11/2^-$	998.4	$9/2^-$		
336.4		555.7	$7/2^+$	219.3	$3/2^+$		
339.8	1.5 *6*	705.2	$9/2^-$	365.2	$7/2^-$		
361.1		1467.0	$13/2^+$	1106.0	$11/2^+$		
366.2		998.4	$9/2^-$	631.2	$7/2^-$		
378.9		378.7	$5/2^-$	0	$1/2^-$		
392.7	4.2 *2*	4103.6	$25/2^+$	3710.4	$23/2^+$		
411.6	1.8 *2*	7857.1	$37/2^+$	7445.1	$35/2^+$	D	DCO ratio: 2.0 *3* (1996Sm07).
443.3	2.8 *3*	3404.2	$21/2^+$	2960.4	$21/2^+$		
446.4	2.9 *3*	4996.0	$27/2^-$	4550.1	$25/2^-$		
459.6	17.0 *10*	793.8	$9/2^+$	334.3	$5/2^+$		
^{x}470[@]	1.6 *2*						
476.5		631.2	$7/2^-$	154.3	$3/2^-$		
482.1	6.4 *3*	6480.3	$33/2^+$	5998.3	$31/2^+$	D	DCO ratio: 1.49 *19* (1996Sm07); γ possibly contaminated by nearby transition.
489.3	10.3 *4*	5238.4	$29/2^+$	4749.2	$27/2^+$	(D)	DCO ratio: 1.40 *12* (1996Sm07); γ possibly contaminated by nearby transition.
527	0.9 *2*	6788.6	$(33/2^+)$	6261.6	$31/2^+$		
550.1		1106.0	$11/2^+$	555.7	$7/2^+$		
619.9		998.4	$9/2^-$	378.7	$5/2^-$		
626.8	14.5 *8*	705.2	$9/2^-$	79.20	$(5/2)^-$		
^{x}645[@]	1.4 *2*						
645.3	19.3 *8*	4749.2	$27/2^+$	4103.6	$25/2^+$		
673.3	16.0 *10*	1467.0	$13/2^+$	793.8	$9/2^+$		
679		811.0	$11/2^+$	132	$9/2^+$		
688.3	31.3 *8*	1053.5	$11/2^-$	365.2	$7/2^-$		
699.3		1330.6	$11/2^-$	631.2	$7/2^-$		
750.5	21.3 *11*	3710.4	$23/2^+$	2960.4	$21/2^+$	D	DCO ratio: 1.75 *11* (1996Sm07); γ possibly contaminated by nearby transition.
752.2	20.3 *7*	1858.2	$15/2^+$	1106.0	$11/2^+$		
759.9	2.4 *9*	5998.3	$31/2^+$	5238.4	$29/2^+$	(D)	DCO ratio: 1.6 *5* (1996Sm07); γ possibly contaminated by nearby transition.
771.7	73.5 *16*	903.7	$13/2^+$	132	$9/2^+$		
797.8	33.3 *15*	1503.2	$13/2^-$	705.2	$9/2^-$		
804.0	1.3 *1*	1802.8	$13/2^-$	998.4	$9/2^-$		
834		1737.8	$15/2^+$	903.7	$13/2^+$		
853.9	14.6 *3*	2321.4	$17/2^+$	1467.0	$13/2^+$		
854.5	31.6 *8*	1908.0	$15/2^-$	1053.5	$11/2^-$		
880.0	3.0 *1*	2210.1	$15/2^-$	1330.6	$11/2^-$		
899.2[&]	1.1 *1*	4041.9?	$(23/2^-)$	3142.7	$19/2^-$		
927		1737.8	$15/2^+$	811.0	$11/2^+$		
929.1	18.5 *7*	2787.3	$19/2^+$	1858.2	$15/2^+$		
932.6	1.9 *1*	3142.7	$19/2^-$	2210.1	$15/2^-$		
935.5	1.1 *2*	2738.3	$17/2^-$	1802.8	$13/2^-$		
942.3	25.9 *13*	2445.5	$17/2^-$	1503.2	$13/2^-$		
953.4[&]		3855.2?	$(23/2^-)$	2901.8	$19/2^-$		
954.1[&]	0.6 *1*	4996.0	$27/2^-$	4041.9?	$(23/2^-)$		
960.0	100.0 *5*	1863.7	$17/2^+$	903.7	$13/2^+$		

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^{58}Ni(^{30}Si,α2pnγ) 1996Sm07 (continued)

$\gamma(^{81}Sr)$ (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	Comments
964.9	6.3 *5*	7445.1	$35/2^+$	6480.3	$33/2^+$		
993.8	29.5 *7*	2901.8	$19/2^-$	1908.0	$15/2^-$		
998.3	1.1 *1*	4141.0	$23/2^-$	3142.7	$19/2^-$		
1005.8	13.0 *6*	3327.2	$21/2^+$	2321.4	$17/2^+$		
1020.2	7.8 *3*	4996.0	$27/2^-$	3975.3	$23/2^-$	Q	DCO ratio: 0.99 *8* (1996Sm07).
1038.6	15.3 *8*	4749.2	$27/2^+$	3710.4	$23/2^+$		
1047.7	17.6 *9*	3493.2	$21/2^-$	2445.5	$17/2^-$		
1056.9	11.1 *15*	4550.1	$25/2^-$	3493.2	$21/2^-$	Q	DCO ratio: 0.90 *11* (1996Sm07).
1060[&]	0.6 *2*	3798.3?	$(21/2^-)$	2738.3	$17/2^-$		
1073.5	19.0 *4*	3975.3	$23/2^-$	2901.8	$19/2^-$		
1096.0	15.8 *7*	3883.3	$23/2^+$	2787.3	$19/2^+$		
1096.7	67.2 *15*	2960.4	$21/2^+$	1863.7	$17/2^+$	Q	DCO ratio: 1.00 *4* (1996Sm07).
1105	0.4 *1*	5246.0	$27/2^-$	4141.0	$23/2^-$		
1125.3	7.5 *7*	5100.6	$27/2^-$	3975.3	$23/2^-$	(Q)	DCO ratio: 1.25 *11* (1996Sm07); γ possibly contaminated by nearby transition.
1134.3	11.0 *7*	6129.8	$31/2^-$	4996.0	$27/2^-$	(Q)	DCO ratio: 0.90 *7* (1996Sm07).
1134.9	16.4 *15*	5238.4	$29/2^+$	4103.6	$25/2^+$		DCO ratio: 0.86 *14* (1996Sm07); γ possibly contaminated by nearby transition.
1140.4[&]		4996.0	$27/2^-$	3855.2?	$(23/2^-)$		
1143.1	11.0 *11*	4470.3	$25/2^+$	3327.2	$21/2^+$		DCO ratio: 0.83 *6* (1996Sm07).
1143.3	30.9 *16*	4103.6	$25/2^+$	2960.4	$21/2^+$		
1155[&]	8.7 *15*	4056.8?	$(23/2^-)$	2901.8	$19/2^-$		
1155.1	9.6 *7*	5705.2	$29/2^-$	4550.1	$25/2^-$	(Q)	DCO ratio: 0.90 *8* (1996Sm07).
1181.2	3.6 *3*	6261.6	$31/2^+$	5080.4	$27/2^+$		DCO ratio: 0.76 *14* (1996Sm07); γ possibly contaminated by nearby transition.
1197.1	8.9 *4*	5080.4	$27/2^+$	3883.3	$23/2^+$		DCO ratio: 0.76 *5* (1996Sm07); γ possibly contaminated by nearby transition.
1205[&]	4.0 *13*	5261.8?	$(27/2^-)$	4056.8?	$(23/2^-)$		
[x]1214	4.6 *2*						Listed in 1996Sm07 with 5/2[303] α=+1/2 band transitions.
1234.1[&]	2.4 *3*	4727.3?	$(25/2^-)$	3493.2	$21/2^-$		
1241.8	16.0 *19*	6480.3	$33/2^+$	5238.4	$29/2^+$		DCO ratio: 0.88 *13* (1996Sm07); γ possibly contaminated by nearby transition.
1249.0	17.7 *19*	5998.3	$31/2^+$	4749.2	$27/2^+$		DCO ratio: 0.84 *14* (1996Sm07); γ possibly contaminated by nearby transition.
1254.8	8.4 *5*	6355.4	$31/2^-$	5100.6	$27/2^-$	Q	DCO ratio: 0.92 *10* (1996Sm07); γ possibly contaminated by nearby transition.
1256[&]		6517.8?	$(31/2^-)$	5261.8?	$(27/2^-)$		
1266.5	8.1 *4*	7396.3	$35/2^-$	6129.8	$31/2^-$	Q	DCO ratio: 0.93 *11* (1996Sm07).
1279.3	8.2 *9*	5749.6	$29/2^+$	4470.3	$25/2^+$	(Q)	DCO ratio: 0.89 *10* (1996Sm07).
1283.9	6.2 *3*	6989.1	$33/2^-$	5705.2	$29/2^-$		DCO ratio: 0.85 *11* (1996Sm07).
1287.1	6.8 *4*	5170.4	$27/2^+$	3883.3	$23/2^+$	(Q)	DCO ratio: 0.91 *11* (1996Sm07).
1377.1	15.0 *11*	7857.1	$37/2^+$	6480.3	$33/2^+$	(Q)	DCO ratio: 0.88 *8* (1996Sm07).
[x]1380.6[@]	4.5 *3*						DCO ratio: 0.80 *11* (1996Sm07).
1383	2.0 *3*	7132.6	$(33/2^+)$	5749.6	$29/2^+$		
1384.2[&]	2.1 *3*	6111.5?	$(29/2^-)$	4727.3?	$(25/2^-)$		
1401.9	5.4 *3*	7757.3	$35/2^-$	6355.4	$31/2^-$	Q	DCO ratio: 1.12 *12* (1996Sm07).
1416.4	5.2 *9*	8405.5	$37/2^-$	6989.1	$33/2^-$		DCO ratio: 0.78 *9* (1996Sm07).
1420.6	7.3 *6*	8816.9	$39/2^-$	7396.3	$35/2^-$	Q	DCO ratio: 0.94 *9* (1996Sm07).
1431.5	6.2 *9*	7181.1	$33/2^+$	5749.6	$29/2^+$		DCO ratio: 0.83 *15* (1996Sm07).
1446.6	8.4 *10*	7445.1	$35/2^+$	5998.3	$31/2^+$	Q	DCO ratio: 1.07 *16* (1996Sm07).
[x]1471[@]							Doublet; a 1471γ appears in spectrum gated by 1471γ.
[x]1485[@]							

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^{58}Ni(^{30}Si,α2pnγ) 1996Sm07 (continued)

γ(^{81}Sr) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	Comments
1488.1	3.1 *3*	9245.4	39/2$^-$	7757.3	35/2$^-$	(Q)	DCO ratio: 0.90 *17* (1996Sm07).
[x]1521	4.1 *7*						Listed by 1996Sm07 with 5/2[422] α=+1/2 band transitions.
1525.9	4.8 *6*	9931.4	41/2$^-$	8405.5	37/2$^-$	(Q)	DCO ratio: 0.93 *25* (1996Sm07).
1527.7[&]		7639.2?	(33/2$^-$)	6111.5?	(29/2$^-$)		
1538[&]	1.1 *2*	8670.6?	(37/2$^+$)	7132.6	(33/2$^+$)		
[x]1538.5[@]	2.5 *3*					Q	DCO ratio: 1.00 *14* (1996Sm07).
1541		3404.2	21/2$^+$	1863.7	17/2$^+$		
1544.4	10.5 *22*	9401.9	41/2$^+$	7857.1	37/2$^+$	Q	DCO ratio: 0.92 *6* (1996Sm07).
1573.8	5.9 *5*	10390.7	43/2$^-$	8816.9	39/2$^-$	Q	DCO ratio: 0.98 *13* (1996Sm07).
1580.6	1.9 *2*	10826.0	(43/2$^-$)	9245.4	39/2$^-$		
[x]1586[@]	2.2 *4*						
1587.3	3.6 *6*	8768.4	37/2$^+$	7181.1	33/2$^+$	Q	DCO ratio: 0.98 *15* (1996Sm07).
[x]1665	2.3 *4*						Coincident with 5/2[422]-band gammas from the 37/2 and lower members, but not with the 41/2 to 37/2 transition.
1671.4[&]	1.4 *4*	9310.6?	(37/2$^-$)	7639.2?	(33/2$^-$)		
1687.2	4.2 *6*	11618.6	45/2$^-$	9931.4	41/2$^-$		DCO ratio: 0.81 *13* (1996Sm07).
1693.3	1.3 *2*	12519.3	(47/2$^-$)	10826.0	(43/2$^-$)		
1711	1.4 *3*	10479.4	41/2$^+$	8768.4	37/2$^+$		
1718.8	4.5 *4*	12109.5	47/2$^-$	10390.7	43/2$^-$		DCO ratio: 0.79 *13* (1996Sm07).
[x]1777	1.1 *2*						Listed by 1996Sm07 with 1/2[431] α=+1/2 band transitions.
1851.8	6.5 *3*	11253.7	45/2$^+$	9401.9	41/2$^+$	Q	DCO ratio: 1.19 *17* (1996Sm07).
1873.1	2.0 *4*	13491.7	(49/2$^-$)	11618.6	45/2$^-$		
1893[&]	0.6 *3*	12372.4?	(45/2$^+$)	10479.4	41/2$^+$		
1895.9	3.4 *2*	14005.4	51/2$^-$	12109.5	47/2$^-$	Q	DCO ratio: 0.97 *18* (1996Sm07).
2090.9	1.1 *3*	15582.6	(53/2$^-$)	13491.7	(49/2$^-$)		
2166.1	1.1 *2*	16171.5	(55/2$^-$)	14005.4	51/2$^-$		
2170.3[&]	3.0 *2*	13424.0?	(49/2$^+$)	11253.7	45/2$^+$		
2545.6	0.4 *1*	18717.1	(59/2$^-$)	16171.5	(55/2$^-$)		

[†] From 1996Sm07, except as noted; ΔE=0.1 to 4 keV.
[‡] Relative to I(960γ)=100.0 *5* (1996Sm07). For Eγ below ≈250 keV, efficiency for $\gamma\gamma$ coin events could not be determined, so Iγ is unavailable for those transitions.
[#] From measured DCO ratio; values expected for pure stretched Q and stretched D transitions are, respectively, 1.0 and 1.7.
[@] Coincident with gammas in the 1/2[431], α=−1/2 band, but not incorporated into band because a self-consistent level scheme could not be established (1996Sm07).
[&] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

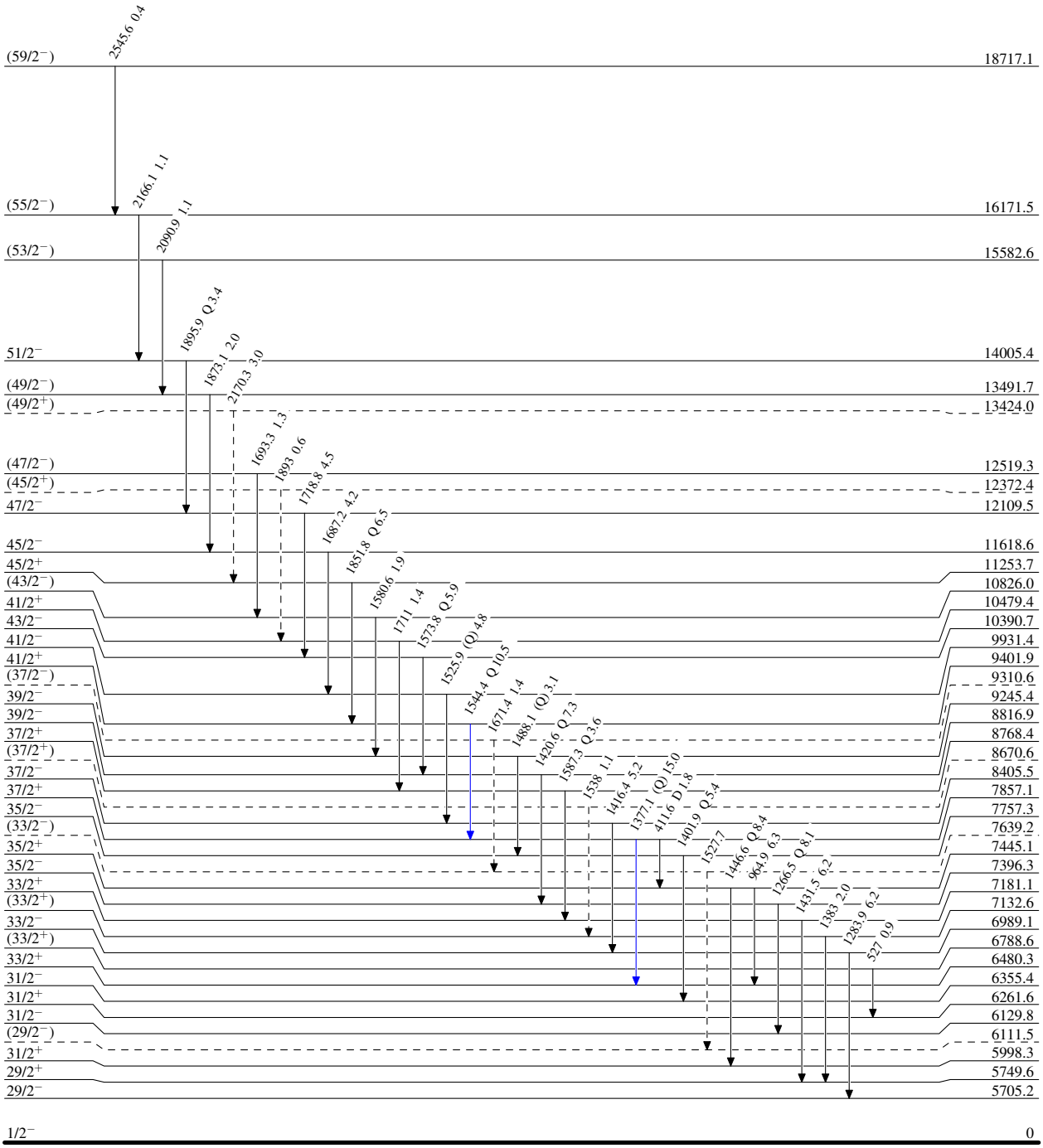
^{58}Ni(^{30}Si,α2pnγ) 1996Sm07

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)



$^{81}_{38}Sr_{43}$

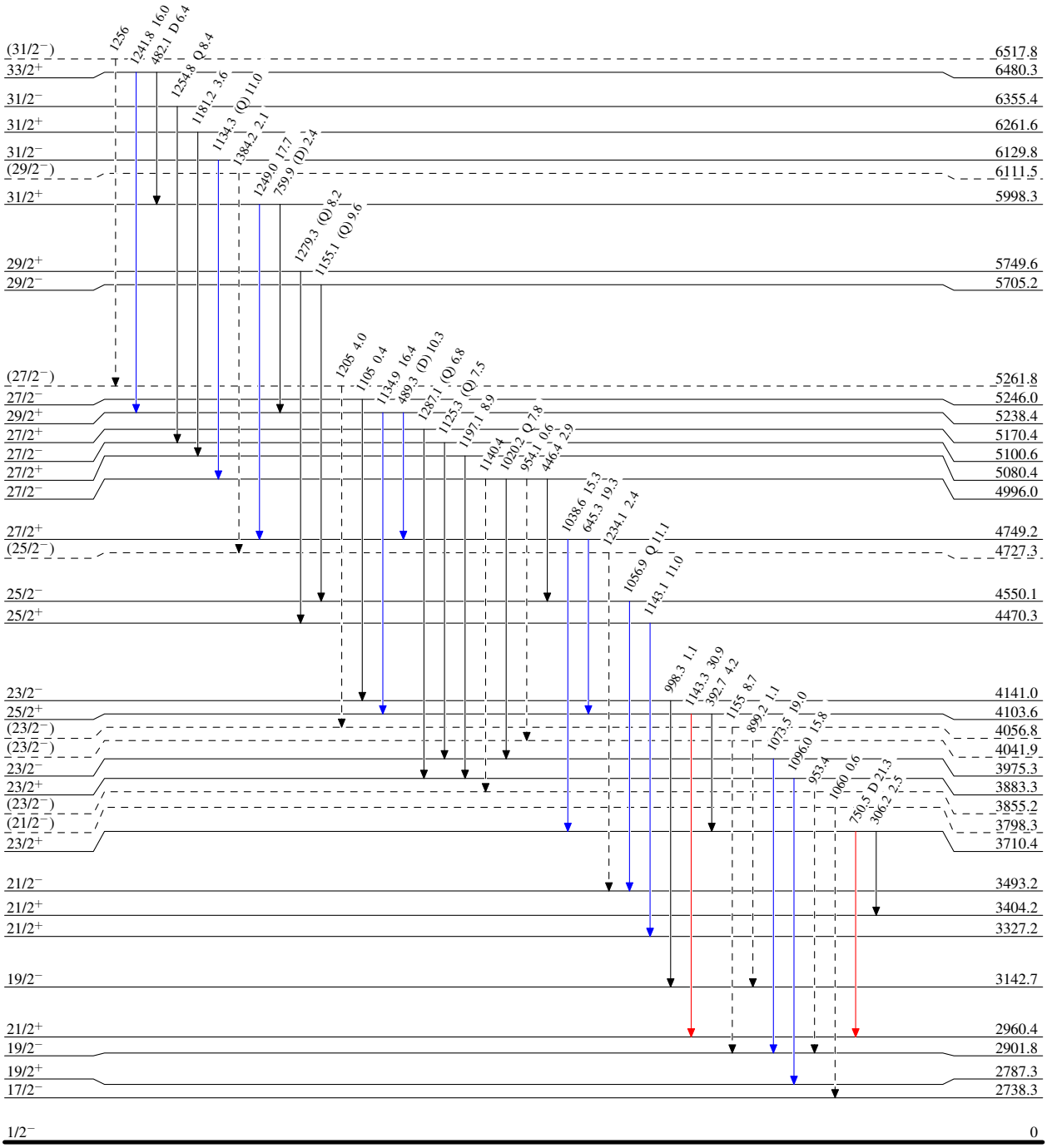
^{58}Ni(^{30}Si,α2pnγ) 1996Sm07

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)



$^{81}_{38}Sr_{43}$

^{58}Ni(^{30}Si,α2pnγ) 1996Sm07

Level Scheme (continued)

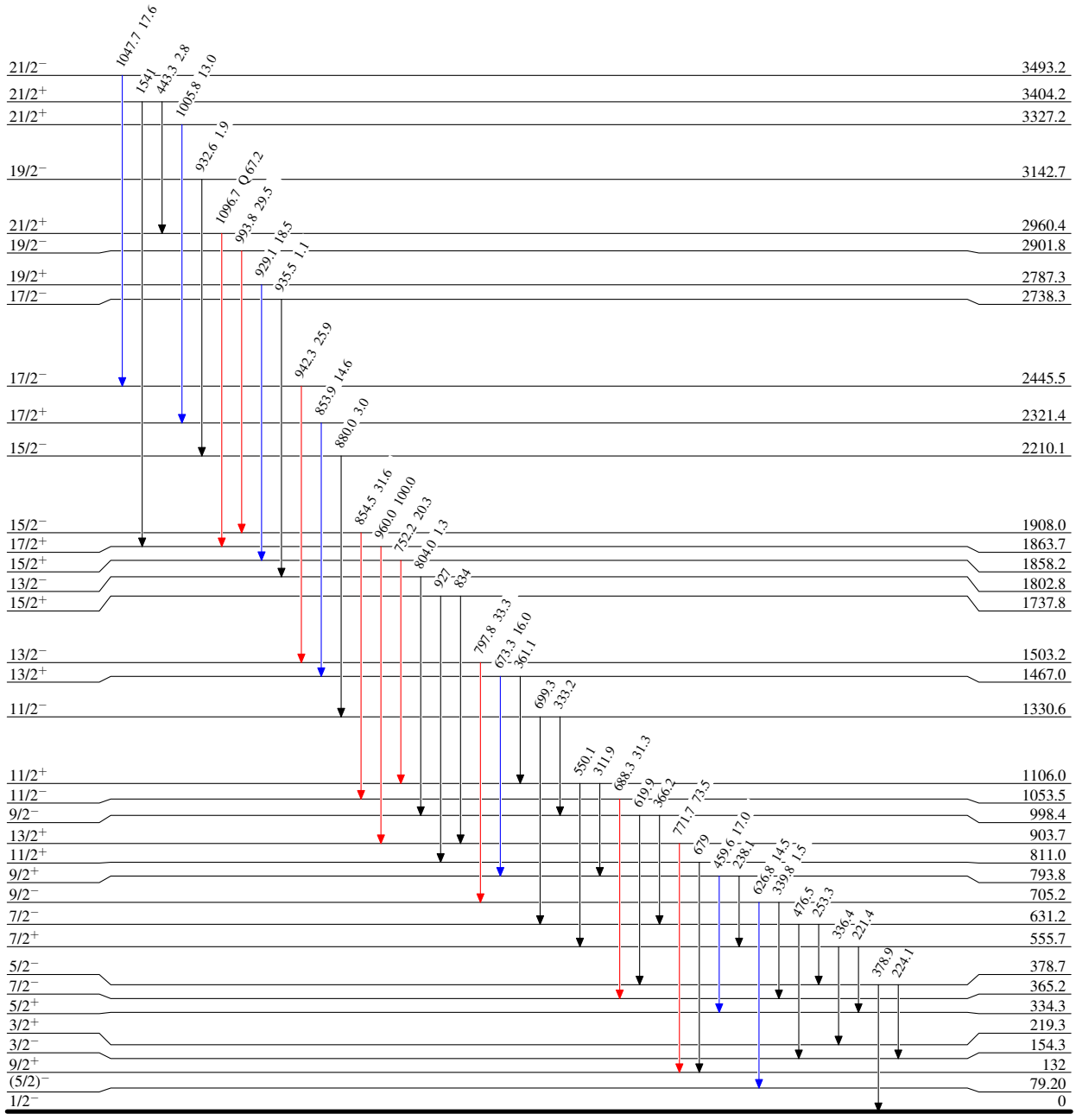
Intensities: Relative I_γ

Legend

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

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

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



$^{81}_{38}Sr_{43}$

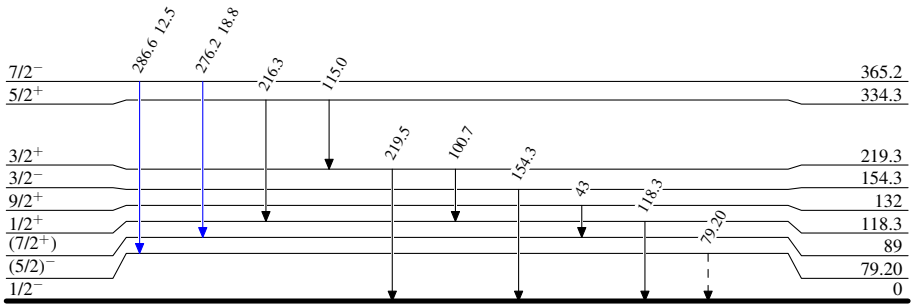
^{58}Ni(^{30}Si,α2pnγ) 1996Sm07

Level Scheme (continued)

Intensities: Relative I_γ

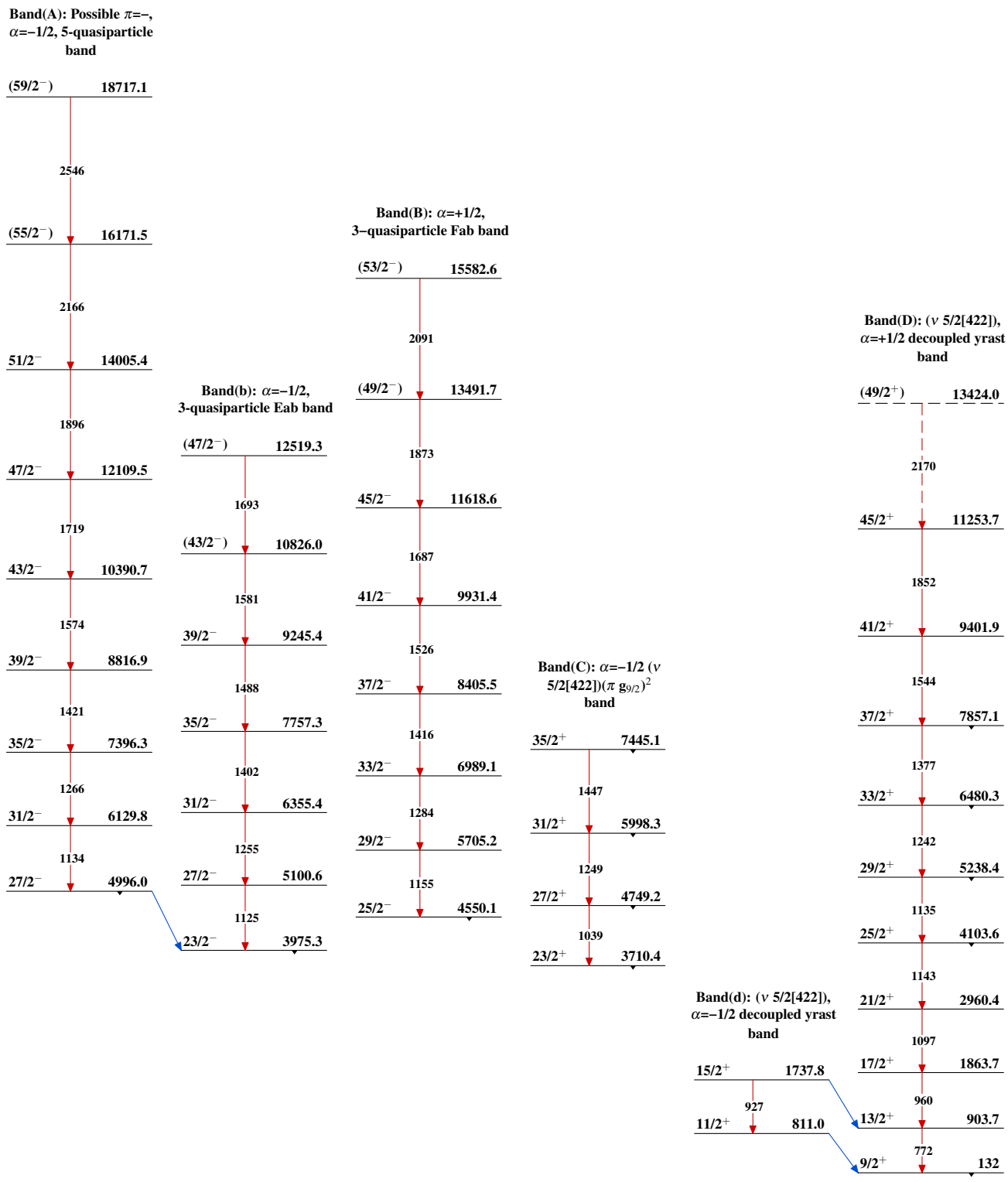
Legend

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



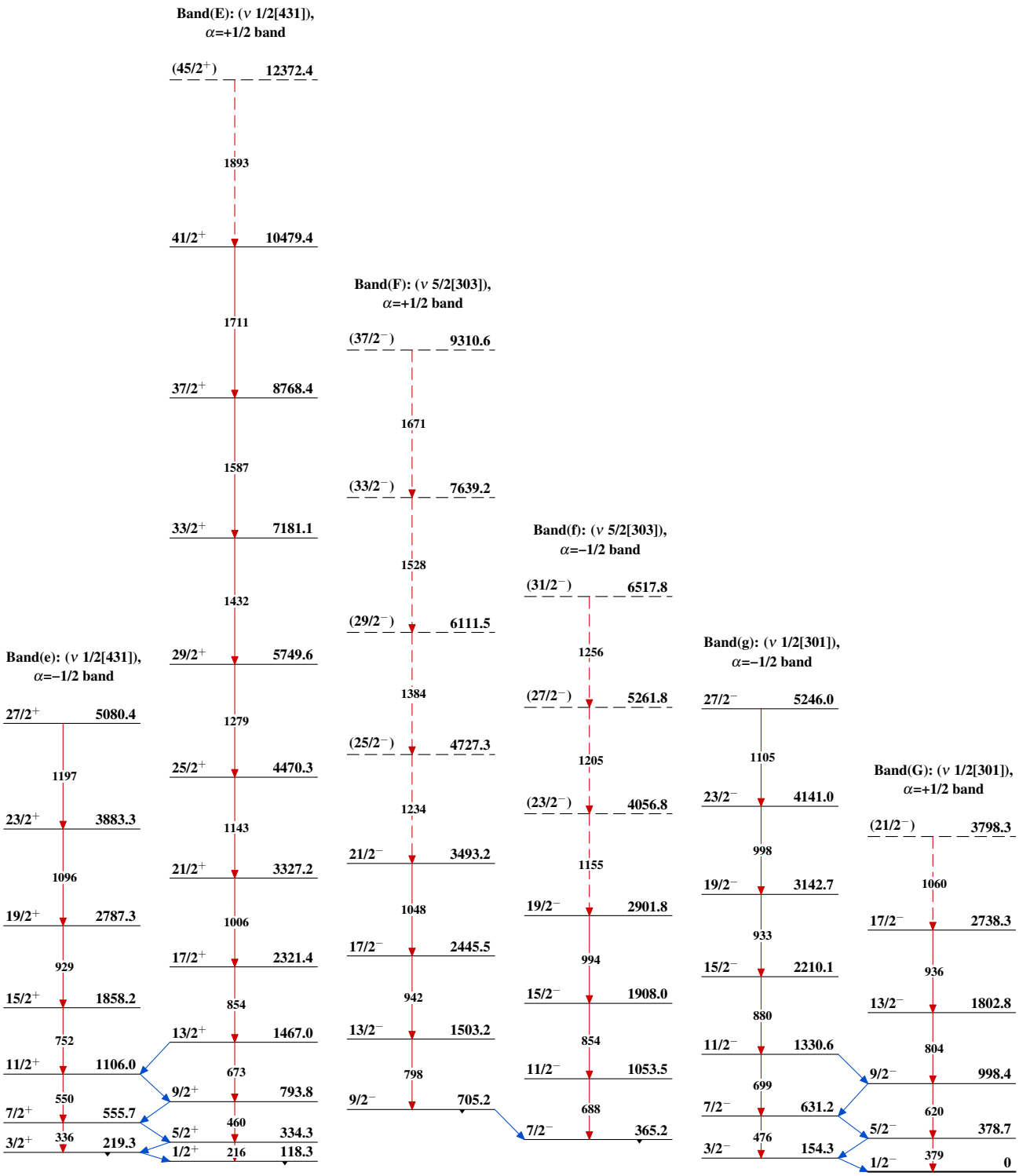
$^{81}_{38}Sr_{43}$

^{58}Ni(^{30}Si,α2pnγ) 1996Sm07



$^{81}_{38}Sr_{43}$

^{58}Ni(^{30}Si,α2pnγ) 1996Sm07 (continued)



$^{81}_{38}Sr_{43}$