^{252}Cf SF decay

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	D. De Frenne	NDS 110, 1745 (2009)	31-Dec-2008

Parent: ^{252}Cf: E=0.0; $J^\pi=0^+$; $T_{1/2}$=2.645 y *8*; %SF decay=?
^{252}Cf-$T_{1/2}$: From 2003Au03.
2008Li45: Experiment performed at LBNL. Measured Eγ, Iγ, γγ, γγ(θ) using GAMMASPHERE array of 102 HPGe detectors with Compton suppression.
1997Ha64,1995HaZZ: ^{252}Cf, ^{242}Pu(SF): measured: SF-decay data, Eγ, Iγ. Deduced: ^{102}Zr levels, J^π, band structure.
1991Ho16,1990Ho12: ^{248}Cm SF. Measured: Eγ, Iγ, γγ. Deduced: ^{102}Zr levels, J^π.
1995Du10: ^{248}Cm SF. Measured: Eγ, γγγ using eurogam. Deduced: ^{102}Zr levels J^π, neutron pairing strength.
1971Ch44: measured: fragment kinetic energies, Eγ, Iγ; (fission)γ-, (fission)x-ray-, γγ- and (K x ray)γ-coin.
1971Ch44 gives also intensities per fission and K x-ray per fission.
The results of 1980ChZM are based on ^{254}Cf SF decay.
Others: 1970Ch11, 1970Wa05, 1971Ho29, 1972Ho08, 1972Wi15, 1974ClZX.

^{102}Zr Levels

Band from 2008Li45.

E(level)†	J^π‡	$T_{1/2}$#	Comments
0.0@	0^+		
151.8@ *3*	2^+	1.91 ns *25*	$T_{1/2}$: weighted average of 1.71 ns *14* (1980ChZM) and 2.21 ns *17* (1974JaZN), both determined by recoil-distance Doppler-shift method. Others: 0.86 ns *18*, recoil-distance Doppler (1970Ch11); 1.7 ns *4*, Ice(t) (1970Wa05). The value 3.17 ns *25* from 1974JaYY is assumed to be τ, rather than $T_{1/2}$, and is then identical to $T_{1/2}$=2.21 ns *17* of 1974JaZN.
478.3@ *3*	4^+		
964.9@ *4*	6^+		
1036.11f *24*	(2^+)		
1242.2f *3*	(3^+)		
1386.3d *4*	(4^+)		
1538.0f *4*	(4^+)		
1595.4@ *4*	8^+	1.39 ps *21*	
1652.7e *4*	(6^+)		
1661.9a *4*	(5^-)		
1793.3 *4*	(3,4)		
1820.8& *4*	(4^-)		
1829.3d *4*	(6^+)		
1932.3b *5*	(8^+)		
1980.7& *5*	(5^-)		
2093.2a *4*	(7^-)		
2174.9& *5*	(6^-)		
2184.5e *4*	(8^+)		
2351.9@ *5*	10^+	0.53 ps *10*	
2373.3d *4*	(8^+)		
2403.2& *5*	(7^-)		
2465.8b *5*	(10^+)		
2663.9a *5*	(9^-)		
2665.8& *5*	(8^-)		

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^{252}Cf SF decay (continued)

^{102}Zr Levels (continued)

E(level)[†]	Jπ[‡]	E(level)[†]	Jπ[‡]	$T_{1/2}$[#]	E(level)[†]	Jπ[‡]
2825.8[e] 5	(10+)	3212.5[@] 6	12+	0.28 ps 4	4153.9[@] 7	14+
2926.4[c] 5	(7)	3371.2[a] 6	(11−)		4162.2[c] 6	(11)
2962.2[&] 5	(9−)	3475.8[c] 6	(9)		4205.2[a] 7	(13−)
3033.3[d] 5	(10+)	3567.5[e] 6	(12+)		4828.1[b] 7	(16+)
3133.8[b] 6	(12+)	3802.0[c] 6	(10)		5168.5[@] 7	16+
3183.6[c] 6	(8)	3925.3[b] 6	(14+)			

[†] From least-squares fit to Eγ's (by evaluator) using uncertainty of 0.3 keV for each γ ray.
[‡] From γγ, γγ(θ), observed band structure and systematics, values the same as the adopted ones.
[#] From Doppler-profile method (1996Sm04), unless otherwise specified of 0.3 keV for each γ ray.
[@] Band(A): g.s. band.
[&] Band(B): ν5/2[532]⊗ν3/2[411].
[a] Band(C): ν5/2[532]⊗5/2[413].
[b] Band(D): Band based on (8+).
[c] Band(E): ΔJ=1 band based on 7. Possible configurations=ν9/2[404]⊗ν5/2[532] or ν9/2[514]⊗ν5/2[413] for 7−; ν9/2[404]⊗ν5/2[413] or ν9/2[514]⊗ν5/2[532] for 7+.
[d] Band(F): ν3/2[411]⊗ν5/2[413].
[e] Band(G): ν9/2[404]⊗ν3/2[411]. Alternate configuration=ν9/2[514]⊗ν3/2[541].
[f] Band(H): Band based on (2+).

γ(^{102}Zr)

Eγ[†]	Iγ[†]	E_i(level)	J^π_i	E_f	J^π_f	Comments
151.8	100 5	151.8	2+	0.0	0+	
159.9	7.7 4	1980.7	(5−)	1820.8	(4−)	
194.2	4.2 6	2174.9	(6−)	1980.7	(5−)	
228.3	3.3 5	2403.2	(7−)	2174.9	(6−)	
257.2	0.9 3	3183.6	(8)	2926.4	(7)	
262.6	1.8 5	2665.8	(8−)	2403.2	(7−)	
282.8	8.0 4	1820.8	(4−)	1538.0	(4+)	
292.2	0.9 3	3475.8	(9)	3183.6	(8)	
296.4	0.9 3	2962.2	(9−)	2665.8	(8−)	
326.2	0.4 1	3802.0	(10)	3475.8	(9)	
326.5	69 3	478.3	4+	151.8	2+	
354.1	1.6 5	2174.9	(6−)	1820.8	(4−)	
360.4	0.20 7	4162.2	(11)	3802.0	(10)	
422.5	1.5 5	2403.2	(7−)	1980.7	(5−)	
431.3	3.3 5	2093.2	(7−)	1661.9	(5−)	
443.0	3.2 5	1829.3	(6+)	1386.3	(4+)	
486.6	44 2	964.9	6+	478.3	4+	
490.9	1.3 4	2665.8	(8−)	2174.9	(6−)	
497.8	2.8 4	2093.2	(7−)	1595.4	8+	
531.8	3.1 5	2184.5	(8+)	1652.7	(6+)	
533.5	2.2 3	2465.8	(10+)	1932.3	(8+)	
544.0	2.1 3	2373.3	(8+)	1829.3	(6+)	
549.4	0.6 2	3475.8	(9)	2926.4	(7)	
551.1	0.20 7	1793.3	(3,4)	1242.2	(3+)	
559.0	1.0 3	2962.2	(9−)	2403.2	(7−)	Initial level=2692.2 in Table 1 of 2008Li45 seems a misprint.
570.7	2.1 3	2663.9	(9−)	2093.2	(7−)	

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^{252}Cf SF decay (continued)

γ(^{102}Zr) (continued)

E_γ [†]	I_γ [†]	E_i(level)	J_i^π	E_f	J_f^π	Comments
578.6	10.5 *5*	1820.8	(4^-)	1242.2	(3^+)	A_2=−0.016 *11*, A_4=−0.034 *16* for 578.6-1090.4 γγ cascade consistent with 4−>3−>2 cascade with mult=Q for 3 -> 2 transition and mult=D for 4 -> 3 transition.
618.4[‡]	0.10 *3*	3802.0	(10)	3183.6	(8)	
630.5	17 *1*	1595.4	8^+	964.9	6^+	
641.3	2.0 *3*	2825.8	(10^+)	2184.5	(8^+)	
660.0	1.0 *3*	3033.3	(10^+)	2373.3	(8^+)	
668.0	1.8 *5*	3133.8	(12^+)	2465.8	(10^+)	
686.2	0.10 *3*	4162.2	(11)	3475.8	(9)	
687.8	0.9 *3*	1652.7	(6^+)	964.9	6^+	
697.0	4.2 *6*	1661.9	(5^-)	964.9	6^+	A_2=−0.118 *27*, A_4=−0.007 *39* for 697.0-486.6 γγ cascade consistent with 5−>6>4 cascade with mult=D for 5 -> 6 transition.
707.3	1.5 *5*	3371.2	(11^-)	2663.9	(9^-)	
741.7	0.9 *3*	3567.5	(12^+)	2825.8	(10^+)	
756.5	5.2 *3*	2351.9	10^+	1595.4	8^+	
757.2	3.7 *6*	1793.3	(3,4)	1036.11	(2^+)	
763.9	2.2 *3*	1242.2	(3^+)	478.3	4^+	
777.9	1.0 *3*	2373.3	(8^+)	1595.4	8^+	
791.5	1.0 *3*	3925.3	(14^+)	3133.8	(12^+)	
834.0	0.8 *2*	4205.2	(13^-)	3371.2	(11^-)	
860.6	0.9 *3*	3212.5	12^+	2351.9	10^+	
864.4	2.7 *4*	1829.3	(6^+)	964.9	6^+	
870.4	0.9 *3*	2465.8	(10^+)	1595.4	8^+	
884.3	3.6 *5*	1036.11	(2^+)	151.8	2^+	
902.8	0.8 *2*	4828.1	(16^+)	3925.3	(14^+)	
908.0	3.7 *6*	1386.3	(4^+)	478.3	4^+	A_2=−0.073 *27*, A_4=+0.149 *40* for 908.0-326.5 γγ cascade consistent with 4−>4−>2 cascade with mult=Q for 4 -> 4 transition.
941.4	0.5 *2*	4153.9	14^+	3212.5	12^+	
967.4	3.3 *5*	1932.3	(8^+)	964.9	6^+	A_2=+0.125 *38*, A_4=+0.03 *6* for 967.4-486.6 γγ cascade consistent with 8−>6−>4 cascade with mult=Q for both transition.
1014.6	0.3 *1*	5168.5	16^+	4153.9	14^+	
1036.1	2.8 *4*	1036.11	(2^+)	0.0	0^+	
1059.7	2.0 *3*	1538.0	(4^+)	478.3	4^+	
1090.4	15 *1*	1242.2	(3^+)	151.8	2^+	A_2=−0.139 *30*, A_4=−0.065 *44* for 1090.4-151.8 γγ cascade consistent with 3−>2−>0 cascade with mult=Q for 3 -> 2 transition. Coefficients have been corrected by the authors for perturbed angular correlations.
1174.4	2.7 *4*	1652.7	(6^+)	478.3	4^+	
1183.6	0.7 *2*	1661.9	(5^-)	478.3	4^+	
1219.6	1.7 *5*	2184.5	(8^+)	964.9	6^+	
1230.4	0.6 *2*	2825.8	(10^+)	1595.4	8^+	
1234.5	1.6 *5*	1386.3	(4^+)	151.8	2^+	
1342.5	0.6 *2*	1820.8	(4^-)	478.3	4^+	
1351.0	1.4 *2*	1829.3	(6^+)	478.3	4^+	
1408.4	1.1 *3*	2373.3	(8^+)	964.9	6^+	
1961.5	1.3 *4*	2926.4	(7)	964.9	6^+	A_2=−0.07 *6*, A_4=−0.10 *9* for 1961.5-326.5 γγ cascade consistent with 7−>6−>4 cascade with mult=D for 7 -> 6 transition.

[†] From 2008Li45 they state that the uncertainty ranges from 5% for strong transitions to 30% for weak transitions. The evaluator assign as follows: 5% for Iγ>5, 15% for Iγ=2-5 and 30% for Iγ<2.

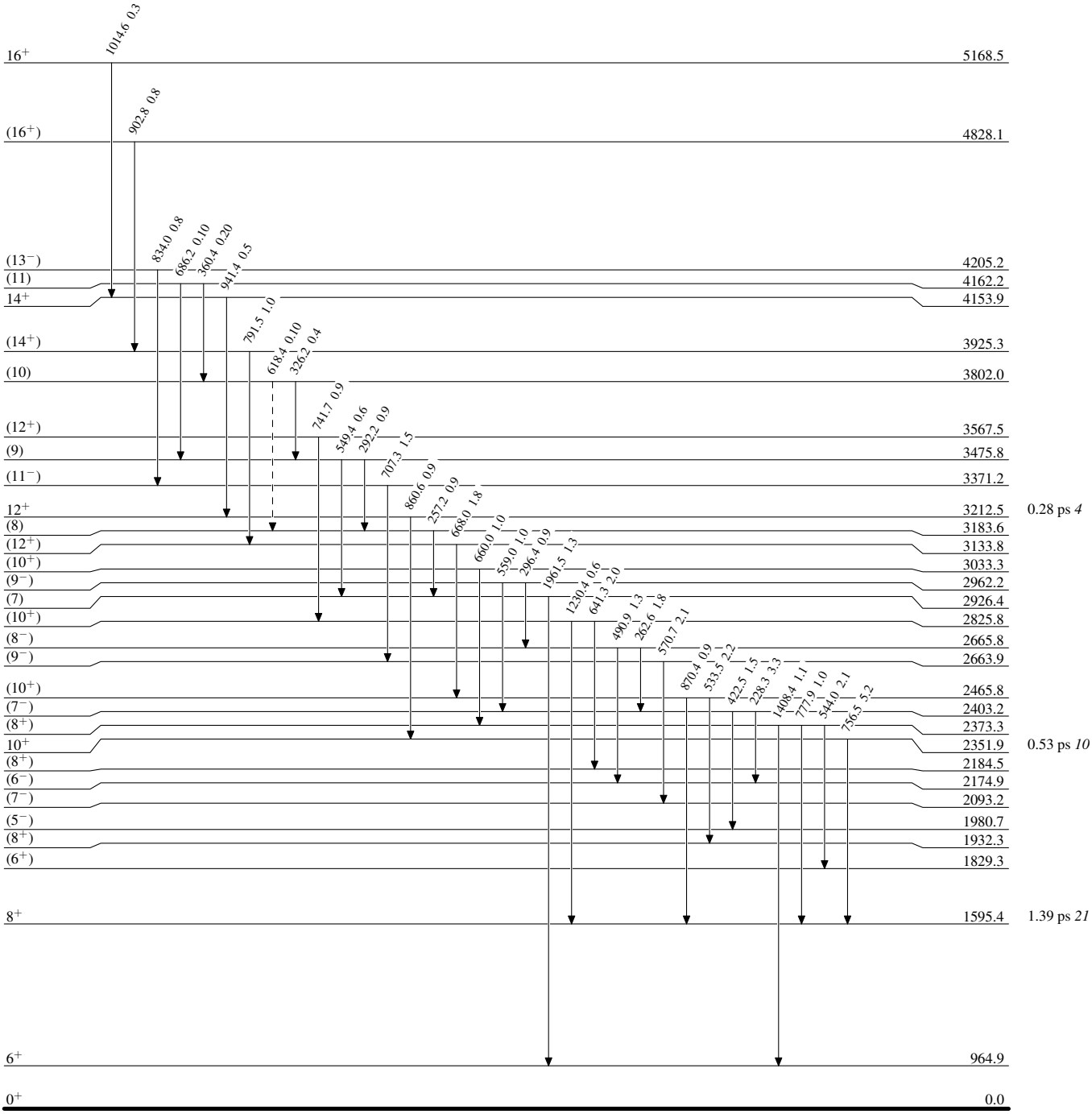
[‡] Placement of transition in the level scheme is uncertain.

^{252}Cf SF decay

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)

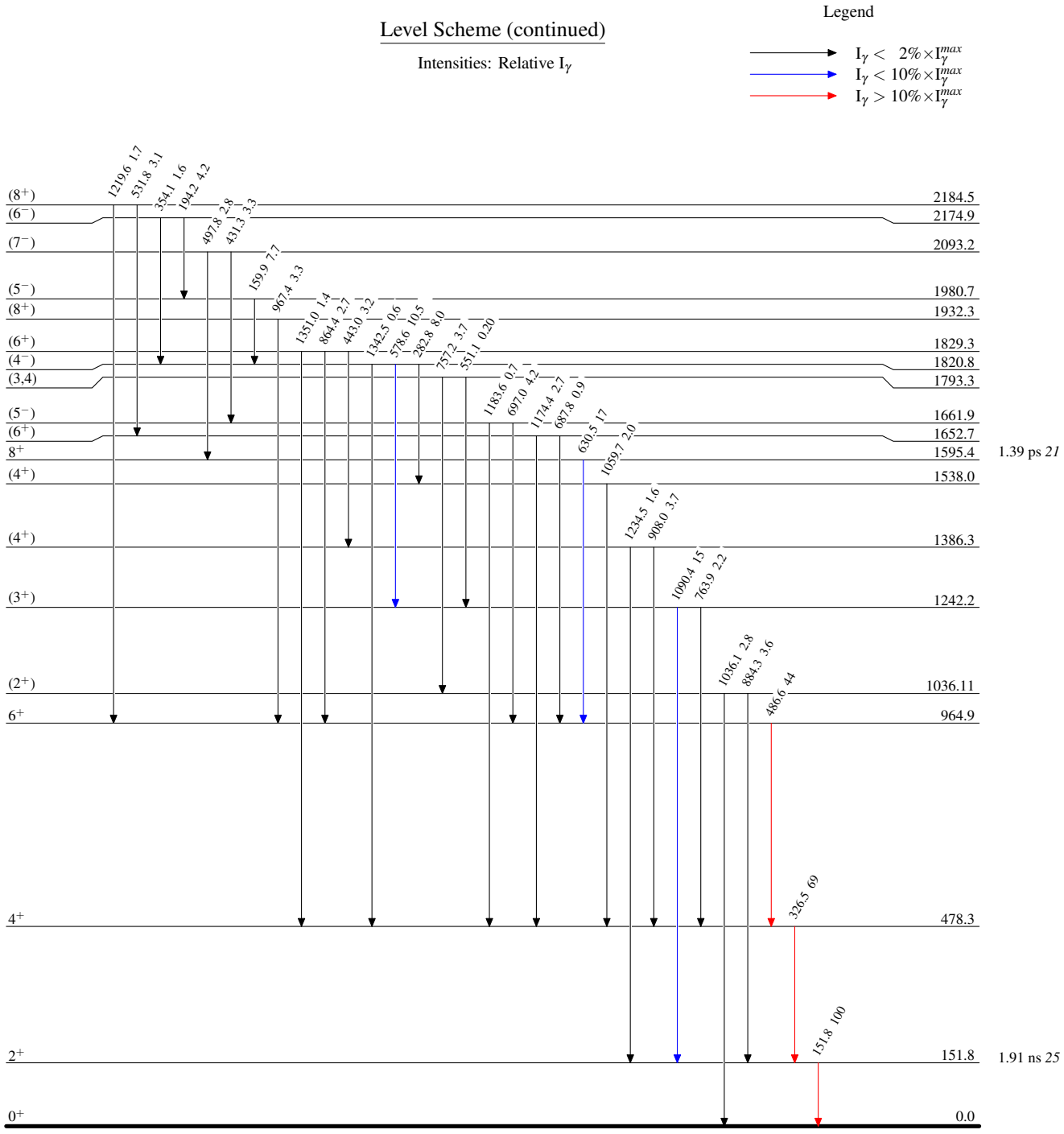


$^{102}_{40}Zr_{62}$

^{252}Cf SF decay

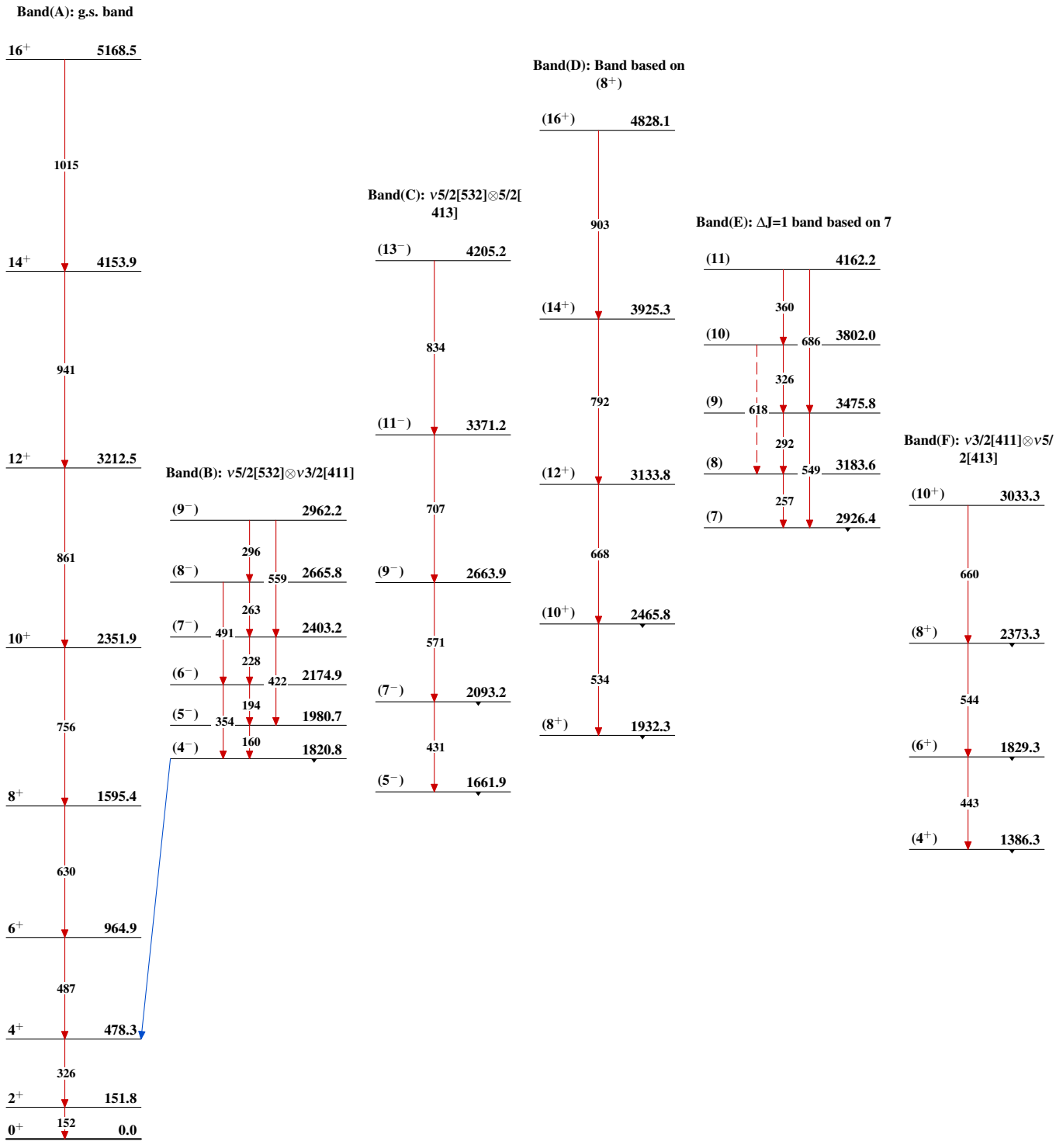
Level Scheme (continued)

Intensities: Relative I_γ



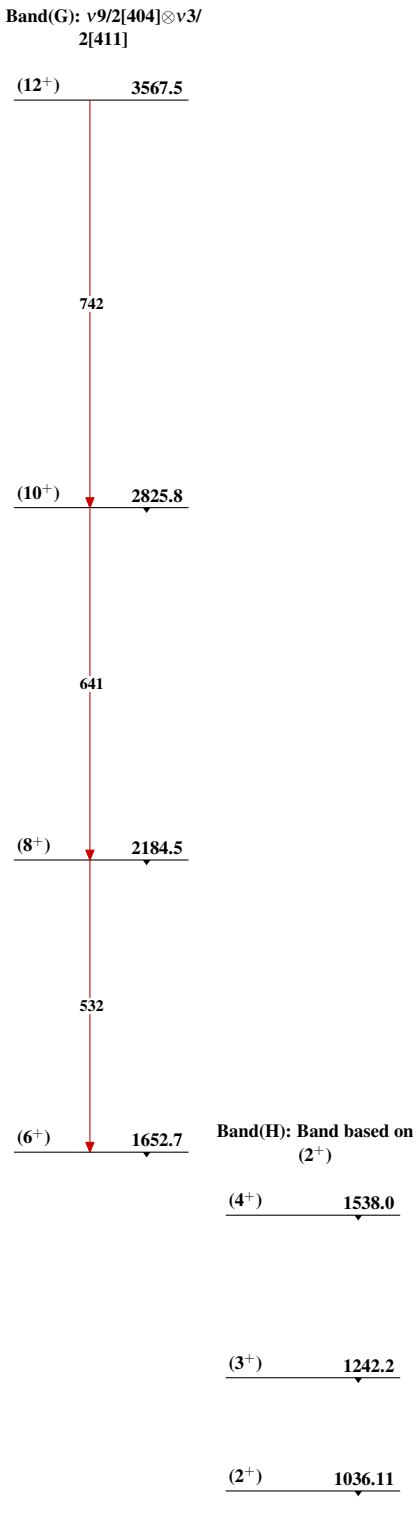
$^{102}_{40}Zr_{62}$

^{252}Cf SF decay



$^{102}_{40}Zr_{62}$

^{252}Cf SF decay (continued)



$^{102}_{40}Zr_{62}$