^{252}Cf SF decay:XUNDL-4 2009Lu18,2009Zh24

Parent: ^{252}Cf: E=0.0; $J^{\pi}=0^+$; $T_{1/2}$=2.645 y *8*; %SF decay=?

Compiled (unevaluated) dataset from 2009Lu18: Int J Mod Phys E 18, 1697 (2009); 2009Zh24: Int J Mod Phys E 18, 1717 (2009).

See also 2009Lu01: Phys Lett B 670, 307 (2009) by the same group, where mainly the negative-parity states are reported.

Compiled by K. Zuber (IFJ,PAN, Krakow) and B. Singh (McMaster), November 27, 2009.

The ^{252}Cf source of strength ≈60 μCi was placed between two iron foils with a thickness of 10mg/cm^2 and placed at the center of Gammasphere detector array, consisting of 101 Compton-suppressed Ge detectors. Measured Eγ, Iγ, $\gamma\gamma(\theta)$, $\gamma\gamma$ coin.

Theoretical calculations; Routhians for ^{108}Ru are calculated using Cranked Shell-model (csm) to interpret the band-crossings. New Total Routhian Surface (trs) indicate that ^{108}Ru have triaxial deformation.

Data for positive-parity states are from 2009Zh24, and for negative- parity states from 2009Lu18.

^{108}Ru Levels

E(level)[†]	J^{π}[‡]	Comments
0.0[@]	0^+	
242.2[@] *2*	2^+	
665.2[@] *2*	4^+	
707.8[&] *2*	2^+	
974.8[a] *2*	3^+	
975.8[#] *3*	0^+	
1182.8[&] *2*	4^+	
1239.9[@] *3*	6^+	
1249.2[#] *2*	2^+	
1495.8[a] *3*	5^+	
1638.8[#] *4*	(4^+)	
1643.8 *2*	(4^+)	E(level): bandhead of two-phonon quasi-gamma band.
1762.3[&] *3*	6^+	
1825.7 *2*	2^+	
1941.7[@] *3*	8^+	
2091.1[#] *5*	(6^+)	
2110.6[d] *3*	5^-	
2132.7[a] *3*	7^+	
2272.8[e] *3*	(6^-)	
2419.9[&] *4*	8^+	
2424.4[c] *3*	6^-	
2472.2[d] *3*	(7^-)	B(E1)(710.0γ)/B(E2)(361.6γ)=9.25×10^{-7}; B(E1)(1232.2γ)/B(E2)(361.6γ)=1.06×10^{-6}.
2476.3[b] *3*	(7^-)	
2715.9[e] *3*	(8^-)	B(E1)(583.2γ)/B(E2)(442.9γ)=1.35×10^{-6}.
2739.3[@] *4*	10^+	
2843.4[a] *4*	9^+	
2857.9[c] *3*	(8^-)	B(E1)(725.1γ)/B(E2)(433.5γ)=8.38×10^{-8}.
2975.1[b] *4*	(9^-)	B(E1)(1033.4γ)/B(E2)(498.9γ)=1.08×10^{-6}.
2984.9[d] *3*	(9^-)	B(E1)(1043.1γ)/B(E2)(512.7γ)=4.56×10^{-7}.
3149.7[&] *5*	10^+	
3293.7[e] *4*	(10^-)	
3423.2[c] *4*	(10^-)	
3527.7[@] *5*	12^+	
3557.0[b] *4*	(11^-)	
3568.9[a] *4*	11^+	
3621.9[d] *4*	(11^-)	
3980.9[e] *5*	(12^-)	
4113.5[c] *5*	(12^-)	

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^{252}Cf SF decay:XUNDL-4 2009Lu18,2009Zh24 (continued)

^{108}Ru Levels (continued)

E(level)[†]	J$^{\pi}$[‡]
4227.0[b] 5	(13$^-$)
4289.9[@] 6	14$^+$
4308.5[a] 5	13$^+$
4375.5[d] 5	(13$^-$)
4774.3[e] 6	(14$^-$)
5153.3[@] 7	16$^+$

[†] From least-squares fit to Eγ's (by compilers), assuming uncertainty of 0.3 keV for each γ ray.
[‡] As given by 2009Lu18 and 2009Zh24 based on $\gamma\gamma(\theta)$ measurements for selected cascades, decay modes and earlier assignments. Values of A_2 and A_4 coefficients are given by the authors for only one cascade.
[#] Band(A): Excited 0$^+$ band.
[@] Band(B): g.s. band.
[&] Band(C): The quasi-γ band, α=0.
[a] Band(c): The quasi-γ band, α=1.
[b] Band(D): Band based on (7$^-$),α=1.
[c] Band(d): Band based on (6$^-$),α=0.
[d] Band(E): Band based on 5$^-$,α=1.
[e] Band(e): Band based on (6$^-$),α=0.

γ(^{108}Ru)

E$_\gamma$	I$_\gamma$[†]	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Comments
242.3	100	242.2	2$^+$	0.0	0$^+$	
422.9	100	665.2	4$^+$	242.2	2$^+$	
465.6	100	707.8	2$^+$	242.2	2$^+$	
707.8	89.0 *24*			0.0	0$^+$	
267.1	9.4 *5*	974.8	3$^+$	707.8	2$^+$	
309.6	4.3 *5*			665.2	4$^+$	
732.6	100			242.2	2$^+$	
733.6	100	975.8	0$^+$	242.2	2$^+$	
207.9	3.4 *6*	1182.8	4$^+$	974.8	3$^+$	
475.0	100			707.8	2$^+$	
517.6	71 *3*			665.2	4$^+$	
940.8	36.3 *18*			242.2	2$^+$	
574.8	100	1239.9	6$^+$	665.2	4$^+$	
273.4	25.0 *15*	1249.2	2$^+$	975.8	0$^+$	
541.3	25.0 *21*			707.8	2$^+$	
584.0				665.2	4$^+$	I$_\gamma$: not obtained since overlapped with another γ.
1007.1	100			242.2	2$^+$	
1249.1	81 *4*			0.0	0$^+$	
312.9	10.0 *22*	1495.8	5$^+$	1182.8	4$^+$	
521.0	100			974.8	3$^+$	
830.6	58 *3*			665.2	4$^+$	
389.6	100	1638.8	(4$^+$)	1249.2	2$^+$	
394.6	44 *3*	1643.8	(4$^+$)	1249.2	2$^+$	
668.9	100			974.8	3$^+$	
936.0	78 *5*			707.8	2$^+$	
1401.5	52 *3*			242.2	2$^+$	
522.4	13.6 *11*	1762.3	6$^+$	1239.9	6$^+$	
579.4	100			1182.8	4$^+$	

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^{252}Cf SF decay:XUNDL-4 2009Lu18,2009Zh24 (continued)

γ(^{108}Ru) (continued)

E_γ	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	Comments
1097.1	13.7 *6*	1762.3	6^+	665.2	4^+		
182.0	17 *2*	1825.7	2^+	1643.8	(4^+)		
576.5	17 *1*			1249.2	2^+		
850.9	67 *4*			974.8	3^+		
1118.0	83 *4*			707.8	2^+		
1583.4	100			242.2	2^+		
701.7	100	1941.7	8^+	1239.9	6^+		
452.3	100	2091.1	(6^+)	1638.8	(4^+)		
466.6	12 *3*	2110.6	5^-	1643.8	(4^+)		
927.8	13.1 *22*			1182.8	4^+		
1445.5	100			665.2	4^+	D	Mult.: from (1445.5γ)(422.5γ)(θ): A_2=−0.073 *13*, A_4=−0.012 *19*. The predicted values for dipole-quadrupole cascade are: A_2=−0.071, A_4=0; and for quadrupole-quadrupole cascade are: A_2=−0.128 and A_4=−0.059.
636.9	100	2132.7	7^+	1495.8	5^+		
892.9	29.0 *25*			1239.9	6^+		
162.3	100	2272.8	(6^-)	2110.6	5^-		
777.1	26.9 *14*			1495.8	5^+		
1032.7	8.8 *6*			1239.9	6^+		
657.6	100	2419.9	8^+	1762.3	6^+		
928.5	42 *11*	2424.4	6^-	1495.8	5^+		
1184.5	100			1239.9	6^+		
199.4	65 *5*	2472.2	(7^-)	2272.8	(6^-)		
361.6	24.1 *19*			2110.6	5^-		
710.0	16.7 *11*			1762.3	6^+		
1232.2	100			1239.9	6^+		
51.9[‡]		2476.3	(7^-)	2424.4	6^-		
714.1				1762.3	6^+		E_γ: from Figure 6 of 2009Lu18; also listed in 2009Lu01. I_γ: not available in table 4 of 2009Lu18.
1236.5	100			1239.9	6^+		I_γ: uncertainty of 12.3 seems a print error.
243.6	≥30.6	2715.9	(8^-)	2472.2	(7^-)		
442.9	100			2272.8	(6^-)		
583.4	20.4 *25*			2132.7	7^+		
797.6	100	2739.3	10^+	1941.7	8^+		
710.5	100	2843.4	9^+	2132.7	7^+		
901.8	5.4 *10*			1941.7	8^+		
381.7	23 *3*	2857.9	(8^-)	2476.3	(7^-)		
433.5	100			2424.4	6^-		
725.1	2.7 *14*			2132.7	7^+		
117.2	20 *6*	2975.1	(9^-)	2857.9	(8^-)		
498.9	100			2476.3	(7^-)		
1033.4	50 *15*			1941.7	8^+		
269.1	23 *4*	2984.9	(9^-)	2715.9	(8^-)		
512.7	100			2472.2	(7^-)		
1043.1	19 *4*			1941.7	8^+		
729.8	100	3149.7	10^+	2419.9	8^+		
308.8	28 *3*	3293.7	(10^-)	2984.9	(9^-)		
577.9	100			2715.9	(8^-)		
448.1	28 *8*	3423.2	(10^-)	2975.1	(9^-)		
565.3	100			2857.9	(8^-)		
788.4	100	3527.7	12^+	2739.3	10^+		
133.7	16 *5*	3557.0	(11^-)	3423.2	(10^-)		
581.9	100			2975.1	(9^-)		
725.5	100	3568.9	11^+	2843.4	9^+		

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^{252}Cf SF decay:XUNDL-4 2009Lu18,2009Zh24 (continued)

$\gamma(^{108}Ru)$ (continued)

E_γ	I_γ †	E_i(level)	J_i^π	E_f	J_f^π	E_γ	I_γ †	E_i(level)	J_i^π	E_f	J_f^π
829.6	5.1 *11*	3568.9	11^+	2739.3	10^+	762.2	100	4289.9	14^+	3527.7	12^+
328.1	19 *4*	3621.9	(11^-)	3293.7	(10^-)	739.6	100	4308.5	13^+	3568.9	11^+
637.0	100			2984.9	(9^-)	753.6	100	4375.5	(13^-)	3621.9	(11^-)
687.2	100	3980.9	(12^-)	3293.7	(10^-)	793.4	100	4774.3	(14^-)	3980.9	(12^-)
690.2	100	4113.5	(12^-)	3423.2	(10^-)	863.4	100	5153.3	16^+	4289.9	14^+
670.0	100	4227.0	(13^-)	3557.0	(11^-)						

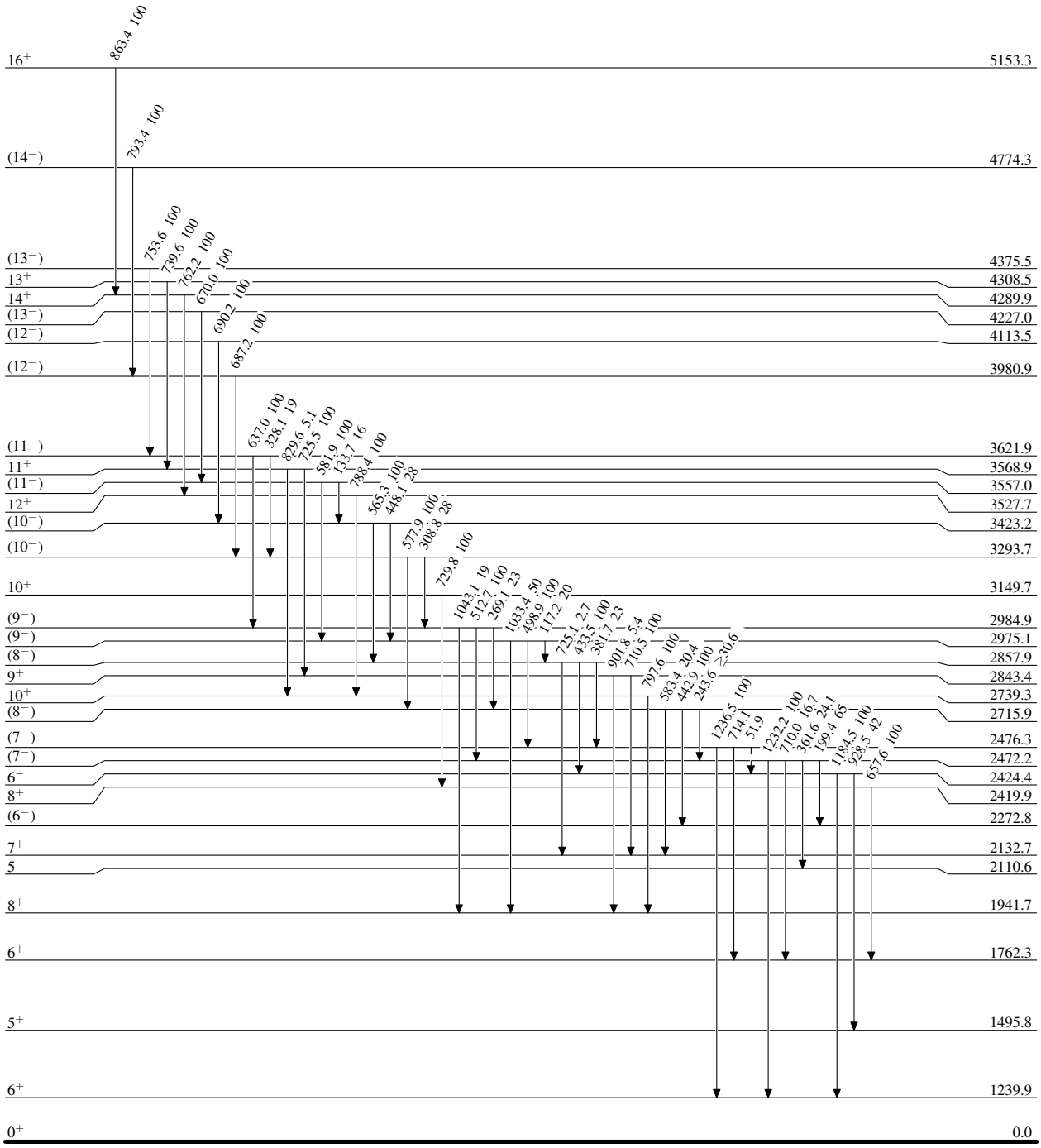
† Relative branching ratios.
‡ Placement of transition in the level scheme is uncertain.

^{252}Cf SF decay:XUNDL-4 2009Lu18,2009Zh24 Legend

Level Scheme

Intensities: Relative photon branching from each level

– – – – – – ► γ Decay (Uncertain)

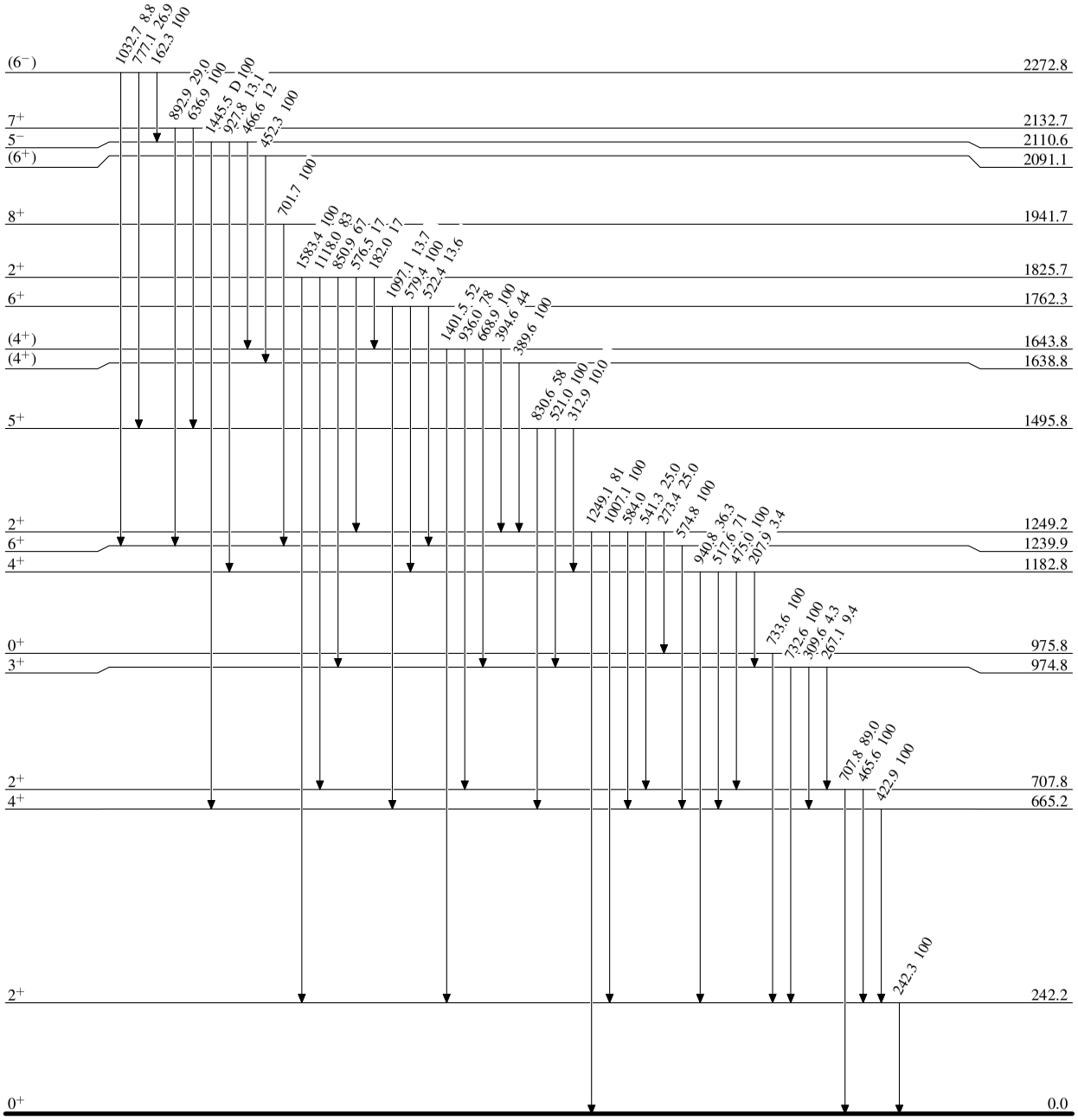


$^{108}_{44}Ru_{64}$

^{252}Cf SF decay:XUNDL-4 2009Lu18,2009Zh24

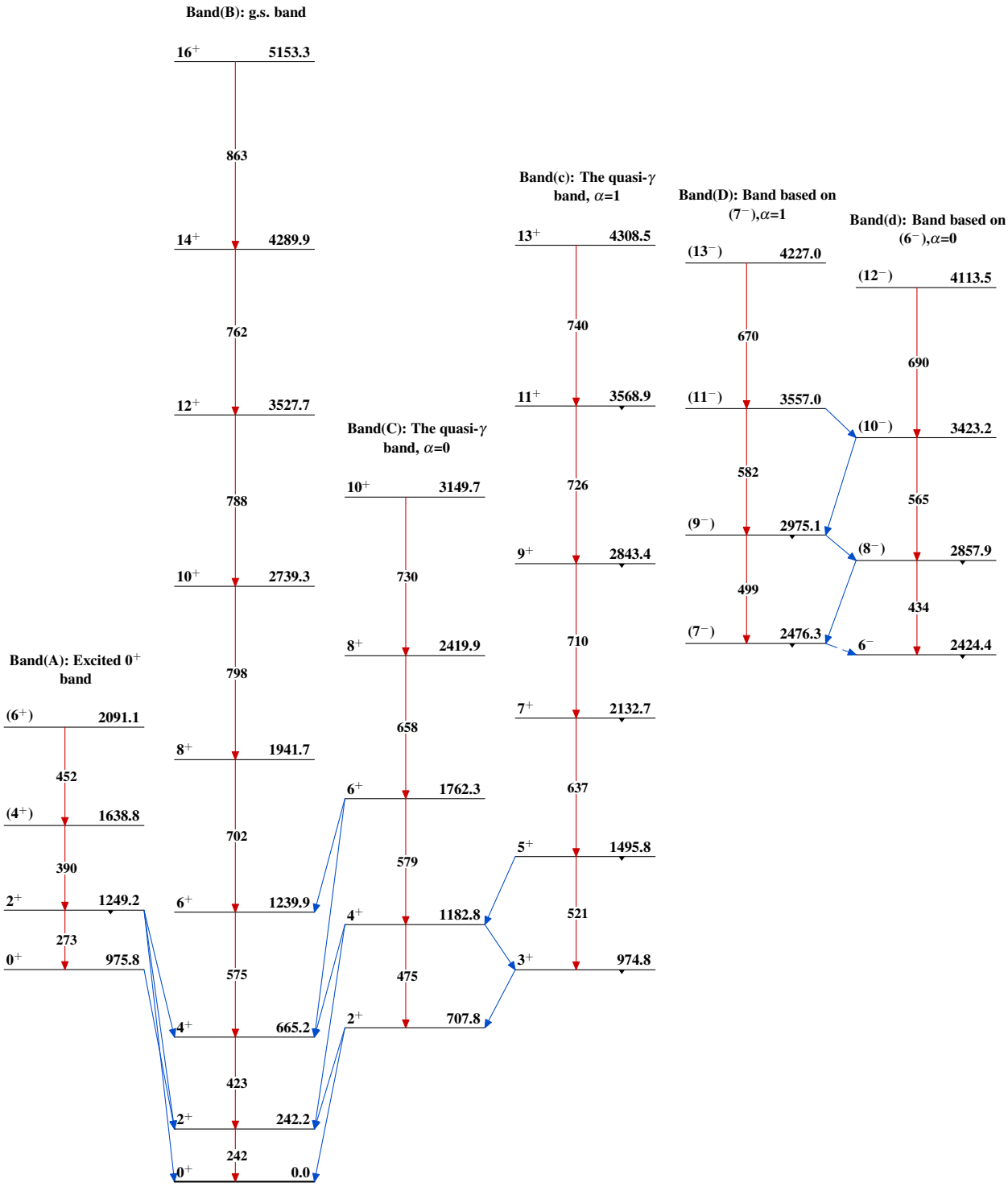
Level Scheme (continued)

Intensities: Relative photon branching from each level



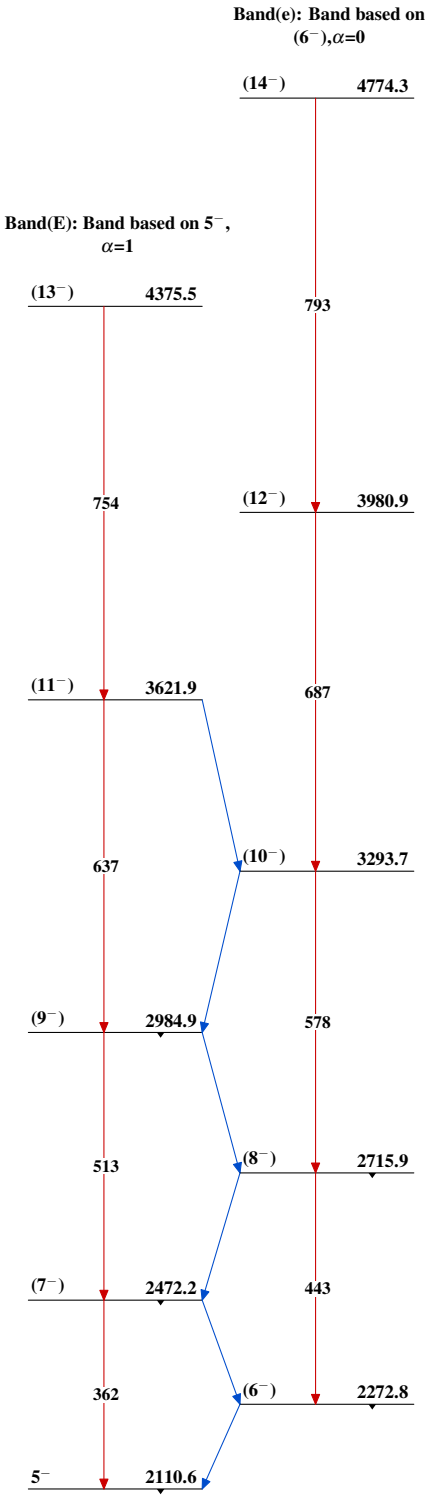
$^{108}_{44}Ru_{64}$

^{252}Cf SF decay:XUNDL-4 2009Lu18,2009Zh24



$^{108}_{44}Ru_{64}$

^{252}Cf SF decay:XUNDL-4 2009Lu18,2009Zh24 (continued)



$^{108}_{44}Ru_{64}$