^{248}Cm SF decay 2016Ur01,2003Ur02,1996Be06

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 154, 1 (2018)	20-Nov-2018

Parent: ^{248}Cm: E=0; J$^{\pi}$=0^{+}; T$_{1/2}$=3.40×10^{5} y *4*; %SF decay=?

2016Ur01 and 2003Ur02 compiled for XUNDL compilation by J. Chen (NSCL, MSU) and B. Singh (McMaster) respectively.

2016Ur01: the ^{248}Cm source was made of potassium chloride mixed with 5 mg of curium oxide. Prompt γ rays following spontaneous fission of ^{248}Cm were detected with the EUROGAM2 array in Strasbourg, consisting of 52 large Ge detectors including 24 four-crystal CLOVER detectors and X rays and low-energy γ rays were detected with four LEPS detectors. Measured Eγ, Iγ, $\gamma\gamma$-coin, $\gamma\gamma\gamma$-coin, $\gamma\gamma(\theta)$. Deduced levels, J, π, bands, mixing ratios. Comparisons with shell-model calculations.

2003Ur02: ^{248}Cm SF decay, EUROGAM2 with 4 LEPs and 52 Compton suppressed Ge detectors, including 24 clover detectors used as Compton polarimeters. Measured Eγ, Iγ, $\gamma\gamma\gamma$, $\gamma\gamma(\theta)$, polarization. Observed coincidence with transition in $^{102-106}$Mo.

1996Be06: ^{248}Cm SF decay, EUROGAM with 5 LEPs, 45 Compton suppressed Ge detectors. Measured $\gamma\gamma\gamma$, x$\gamma\gamma$. Observed coincidence with transition in ^{106}Mo.

Most data and level scheme is from 2016Ur01 (updating results from previous articles.

Unless otherwise specified data are from 2016Ur01.

There is disagreement as concerns the nature of some bands in this set of SF decay data and the other set of SF decay data (see the disagreement argument in ^{252}Cf decay dataset).

No possible normalization to absolute values of ^{248}Cm SF decay.

^{140}Xe Levels

E(level)†	J$^{\pi}$‡	E(level)†	J$^{\pi}$‡	E(level)†	J$^{\pi}$‡	E(level)†	J$^{\pi}$‡
0.0@	0^{+}	1771.50& *8*	5^{-}	2736.29& *9*	9^{-}	3729.83b *13*	(12)
376.66@ *5*	2^{+}	1954.55a *8*	7^{+}	2775.23b *10*	(8)	3812.83& *12*	(13^{-})
834.46@ *7*	4^{+}	1983.48@ *9*	8^{+}	2933.26 *10*	10	3998.12@ *12*	(14^{+})
1304.53a *8*	3^{+}	2184.70& *8*	7^{-}	2965.80c *13*	(10^{+})	4125.85a *14*	
1416.83@ *8*	6^{+}	2256.66c *9*	(8^{+})	3159.68b *12*	(10)	4434.04& *16*	
1443.0 *3*		2282.2?b *14*	(4)#	3246.58& *10*	11^{-}	4745.25@ *15*	(16^{+})
1513.12& *14*	3^{-}	2489.2?b *15*	(6)#	3269.87@ *11*	12^{+}	5166.84& *18*	
1573.10a *8*	5^{+}	2589.06a *9*	9^{+}	3283.30a *10*		5505.5@ *3*	(18^{+})
1725.86c *8*	6^{+}	2590.74@ *9*	10^{+}	3704.5c *4*			

† From a least-squares fit to γ-ray energies.

‡ As given in 2016Ur01, based on measured $\gamma\gamma(\theta)$.

Levels not observed here but in ^{252}Cf decay dataset as part of band D (see the disagreement comment in the respective dataset).

@ Band(A): Yrast band.

& Band(B): 3^{-} octupole band.

a Band(C): Positive band based on 3^{+}.

b Band(D): Band based on J=(4). Assigned as band referring to the work of 2016Ur01 by 2017Na15 (^{252}Cf Decay) in a discussion about its nature in contradiction with 2016Hu10 ((see the disagreement comment in ^{252}Cf Decay dataset); no parity was adopted because of opposite assignments. Only the energies of the last three levels and their decaying γ's were observed in this dataset by 2016Ur01. All other data (all spins and first two level energies) are from ^{252}Cf Decay.

c Band(E): band based on J=6^{+}.

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$\gamma(^{140}Xe)$

Quoted values of A_2 and A_4 are determined from a spectrum being a sum of γ spectra gated on lines in the cascade below the line of interest (2016Ur01), unless otherwise noted.

E_γ [†]	I_γ [†]	E_i(level)	J^π_i	E_f	J^π_f	Mult. [‡]	δ [‡]	Comments
156.3 *1*	0.32 *5*	1573.10	5+	1416.83	6+			
197.8 *2*	0.3 *1*	2933.26	10	2736.29	9−			E_γ: poor fit.
228.70 *7*	0.9 *1*	1954.55	7+	1725.86	6+			
258.5 *2*	0.2 *1*	1771.50	5−	1513.12	3−			
268.60 *6*	0.9 *1*	1573.10	5+	1304.53	3+			
273.24 *6*	1.2 *1*	2256.66	(8+)	1983.48	8+			
280.92 *21*	0.4 *2*	3246.58	11−	2965.80	(10+)			
302.22 *9*	0.5 *1*	2256.66	(8+)	1954.55	7+			
309.10 *5*	4.0 *2*	1725.86	6+	1416.83	6+	M1+E2	+0.48 *4*	A_2=+0.204 *5*, A_4=−0.012 *8*.
313.3 *2*	0.3 *1*	3246.58	11−	2933.26	10			
332.5 *2*	0.2 *1*	2589.06	9+	2256.66	(8+)			
350.0 *4*	0.2 *1*	3283.30		2933.26	10			
376.66 *5*	100 *3*	376.66	2+	0.0	0+	E2		A_2=+0.104 *2*, A_4=+0.012 *3*.
376.8 *2*	0.3 *1*	2965.80	(10+)	2589.06	9+			
381.48 *5*	8.2 *4*	1954.55	7+	1573.10	5+	E2		A_2=+0.126 *5*, A_4=−0.009 *8* for 381.5γ-738.6γ cascade (2016Ur01).
384.45 *15*	0.3 *1*	3159.68	(10)	2775.23	(8)			
413.20 *7*	1.5 *1*	2184.70	7−	1771.50	5−			
446.6 *1*	0.5 *1*	3729.83	(12)	3283.30				
457.78 *5*	87 *3*	834.46	4+	376.66	2+	E2		A_2=+0.104 *5*, A_4=+0.007 *7*.
459.0 *2*	0.3 *1*	2184.70	7−	1725.86	6+			
470.10 *9*	0.9 *2*	1304.53	3+	834.46	4+	M1+E2	−0.11 *2*	A_2=−0.045 *13*, A_4=+0.003 *22*.
479.55 *8*	2.0 *2*	2736.29	9−	2256.66	(8+)			
510.30 *6*	5.5 *5*	3246.58	11−	2736.29	9−			
530.55 *12*	1.1 *2*	2256.66	(8+)	1725.86	6+			
537.70 *5*	4.1 *2*	1954.55	7+	1416.83	6+			
543.0 *3*	0.2 *1*	3812.83	(13−)	3269.87	12+			
551.64 *5*	5.1 *3*	2736.29	9−	2184.70	7−			
566.25 *7*	2.4 *3*	3812.83	(13−)	3246.58	11−			
566.64 *5*	35 *1*	1983.48	8+	1416.83	6+			A_2=+0.100 *4*, A_4=+0.017 *7*.
569.9 *2*	0.3 *2*	3729.83	(12)	3159.68	(10)			
570.55 *10*	1.5 *2*	3159.68	(10)	2589.06	9+			
582.44 *5*	54 *2*	1416.83	6+	834.46	4+	E2		A_2=+0.103 *5*, A_4=+0.022 *8*. Other: A_2=+0.104 *6*, A_4=+0.015 *9* for 582.4γ-457.8γ cascade (2016Ur01).
606.0 *3*	3 *1*	2589.06	9+	1983.48	8+			
607.25 *5*	18 *1*	2590.74	10+	1983.48	8+			A_2=+0.060 *4*, A_4=+0.043 *8*.
621.2 *1*	1.7 *2*	4434.04		3812.83	(13−)			
634.50 *5*	5.9 *4*	2589.06	9+	1954.55	7+	E2		A_2=+0.099 *13*, A_4=+0.037 *22* for 634.5γ-381.5γ cascade (2016Ur01).
655.3 *3*	0.7 *1*	3246.58	11−	2590.74	10+			(656)(sum)(θ): A_2=− 0.11 *3*, A_4=+ 0.01 *4* (2003Ur02).
679.11 *5*	6.7 *3*	3269.87	12+	2590.74	10+			A_2=+0.091 *10*, A_4=−0.012 *16*.
692.6 *1*	1.3 *2*	3283.30		2590.74	10+			
694.26 *6*	1.6 *2*	3283.30		2589.06	9+			
709.40 *15*	0.7 *2*	2965.80	(10+)	2256.66	(8+)			
728.25 *6*	1.6 *2*	3998.12	(14+)	3269.87	12+	E2		A_2=+0.064 *14*, A_4=−0.119 *24*.
732.80 *8*	0.9 *1*	5166.84		4434.04				
738.64 *5*	10.6 *5*	1573.10	5+	834.46	4+	M1+E2	+0.51 *2*	A_2=+0.189 *5*, A_4=−0.017 *8*. Other: A_2=+0.125 *8*, A_4=−0.010 *11* for 738.6γ-381.5γ cascade

Continued on next page (footnotes at end of table)

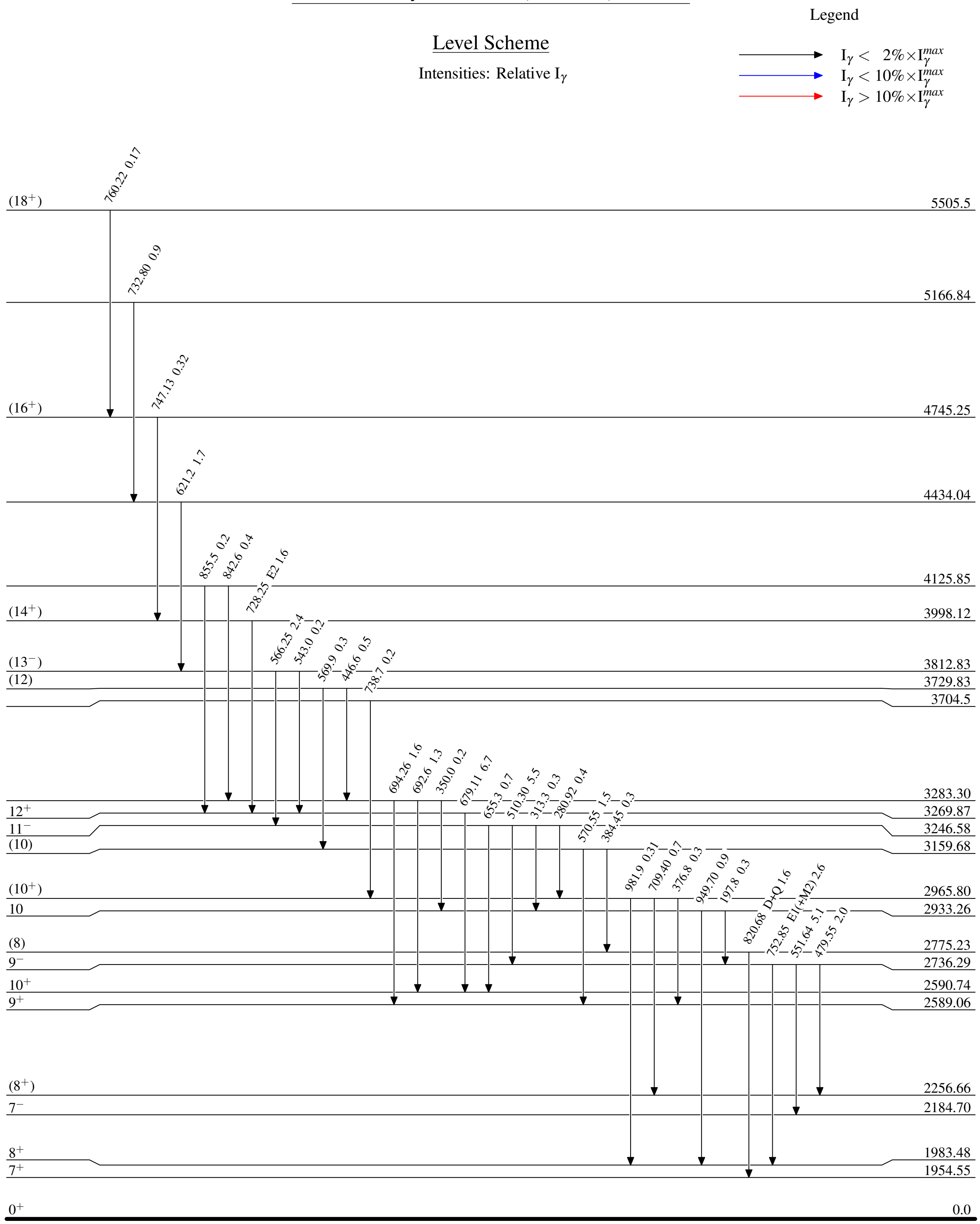
^{248}Cm SF decay 2016Ur01,2003Ur02,1996Be06 (continued)

$\gamma(^{140}Xe)$ (continued)

E_γ†	I_γ†	E_i(level)	J^π_i	E_f	J^π_f	Mult.‡	δ‡	Comments
								(2016Ur01). δ: also +50 *2*.
738.7 *3*	0.2 *1*	3704.5		2965.80	(10⁺)			
747.13 *9*	0.32 *5*	4745.25	(16⁺)	3998.12	(14⁺)			
752.85 *5*	2.6 *2*	2736.29	9⁻	1983.48	8⁺	E1(+M2)	+0.007 *14*	A_2=−0.066 *11*, A_4=+0.016 *17*. (753)(510)(θ): A_2=− 0.07 *2*, A_4=− 0.01 *3*, (753)(sum)(θ): A_2=− 0.13 *2*, A_4=− 0.02 *1*, POL=+ 0.16 *8* (2003Ur02).
760.22 *24*	0.17 *4*	5505.5	(18⁺)	4745.25	(16⁺)			
767.92 *5*	5.0 *2*	2184.70	7⁻	1416.83	6⁺	E1(+M2)	+0.01 *2*	A_2=−0.065 *9*, A_4=−0.008 *16*. (768)(552)(θ): A_2=− 0.04 *3*, A_4=− 0.02 *1*, (768)(sum)(θ): A_2=− 0.07 *3*, A_4=+ 0.01 *1*, POL=+ 0.08 *4* (2003Ur02).
820.68 *7*	1.6 *2*	2775.23	(8)	1954.55	7⁺	D+Q		Mult.,δ: contradictorily assigned in ^{252}Cf decay dataset as (M1+E2) with δ=+0.21 *11* or or +3.9 *15* (2017Na15), and (E1) (2016Hu10), neither of which being adopted here (see general disagreement comment).
839.79 *7*	1.5 *2*	2256.66	(8⁺)	1416.83	6⁺			
842.6 *1*	0.4 *1*	4125.85		3283.30				
855.5 *3*	0.2 *1*	4125.85		3269.87	12⁺			
891.20 *7*	3.2 *2*	1725.86	6⁺	834.46	4⁺			A_2=+0.100 *35*, A_4=+0.065 *58*.
927.90 *9*	2.6 *2*	1304.53	3⁺	376.66	2⁺	M1+E2	+0.65 *15*	A_2=+0.254 *23*, A_4=+0.058 *43* for 927.9γ-376.7γ cascade (2016Ur01).
937.03 *5*	3.7 *2*	1771.50	5⁻	834.46	4⁺	E1(+M2)	+0.02 *2*	A_2=−0.062 *14*, A_4=−0.005 *23*. (937)(413)(θ): A_2=− 0.05 *2*, A_4=− 0.07 *3*, $(937)(sum)(θ): A_2=− 0.10 *3*, A_4=+ 0.02 *4* (2003Ur02).
949.70 *6*	0.9 *1*	2933.26	10	1983.48	8⁺			
981.9 *2*	0.31 *5*	2965.80	(10⁺)	1983.48	8⁺			
1066.3 *3*	0.2 *1*	1443.0		376.66	2⁺			
1136.52 *15*	1.2 *2*	1513.12	3⁻	376.66	2⁺	(E1)		Mult.: ΔJ=1 from γγ(θ) (2003Ur02) adopted as (E1) as interband Δπ=yes transition. (1136)(377)(θ): A_2=− 0.11 *2*, A_4=− 0.06 *4* (2003Ur02).

† From 2016Ur01.
‡ From measured γγ(θ) (2016Ur01 and 2003Ur02) and polarization (2003Ur02) combined with extra level scheme or theoretical arguments. When no polarization information is available ΔJ=2 transitions were adopted as E2 while ΔJ=1 transitions were adopted tentatively as (M1) or (E1) depending on other arguments. Some stronger quadrupole admixtures on dipole transitions can be adopted as M1+E2.

^{248}Cm SF decay 2016Ur01,2003Ur02,1996Be06

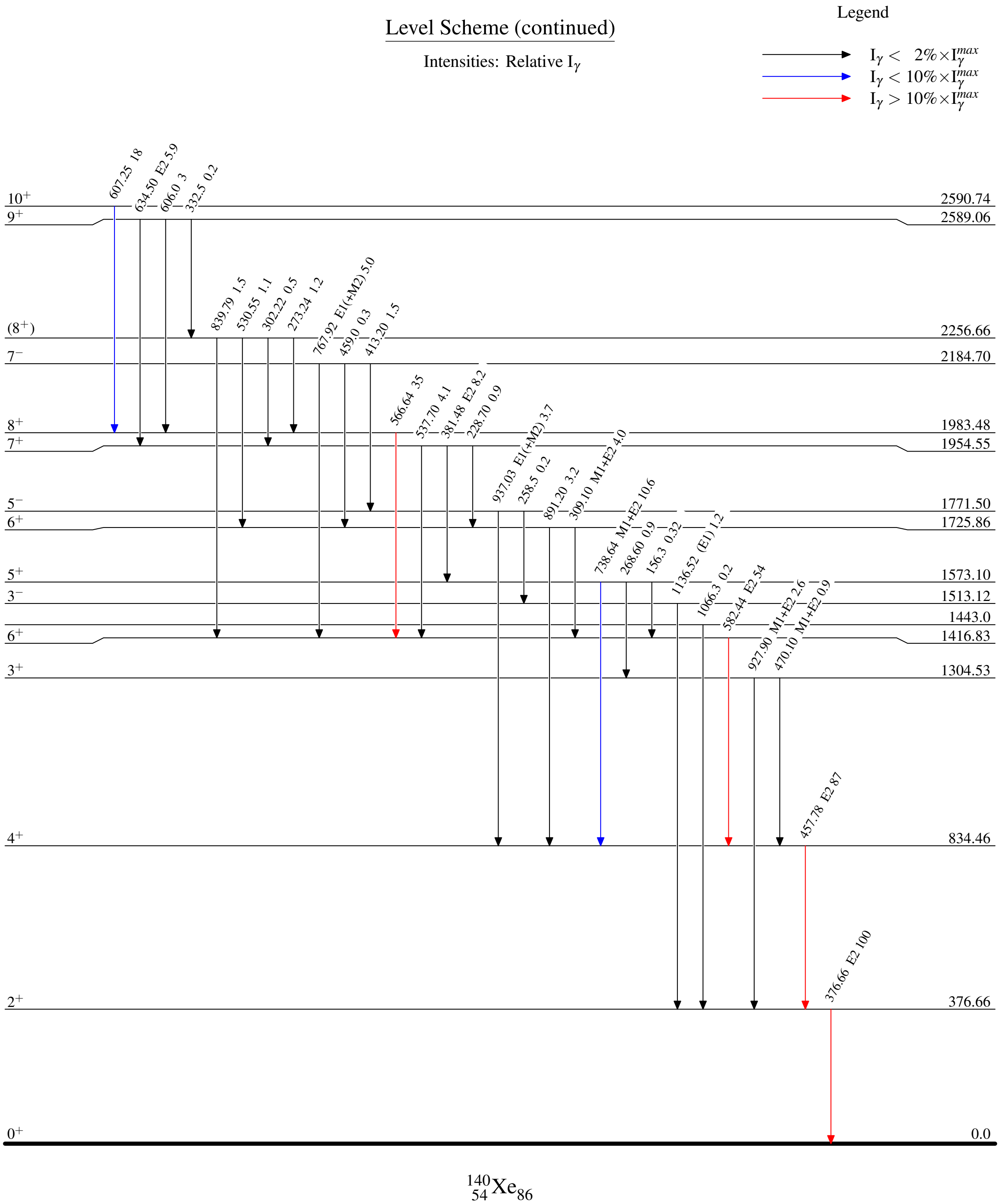


$^{140}_{54}Xe_{86}$

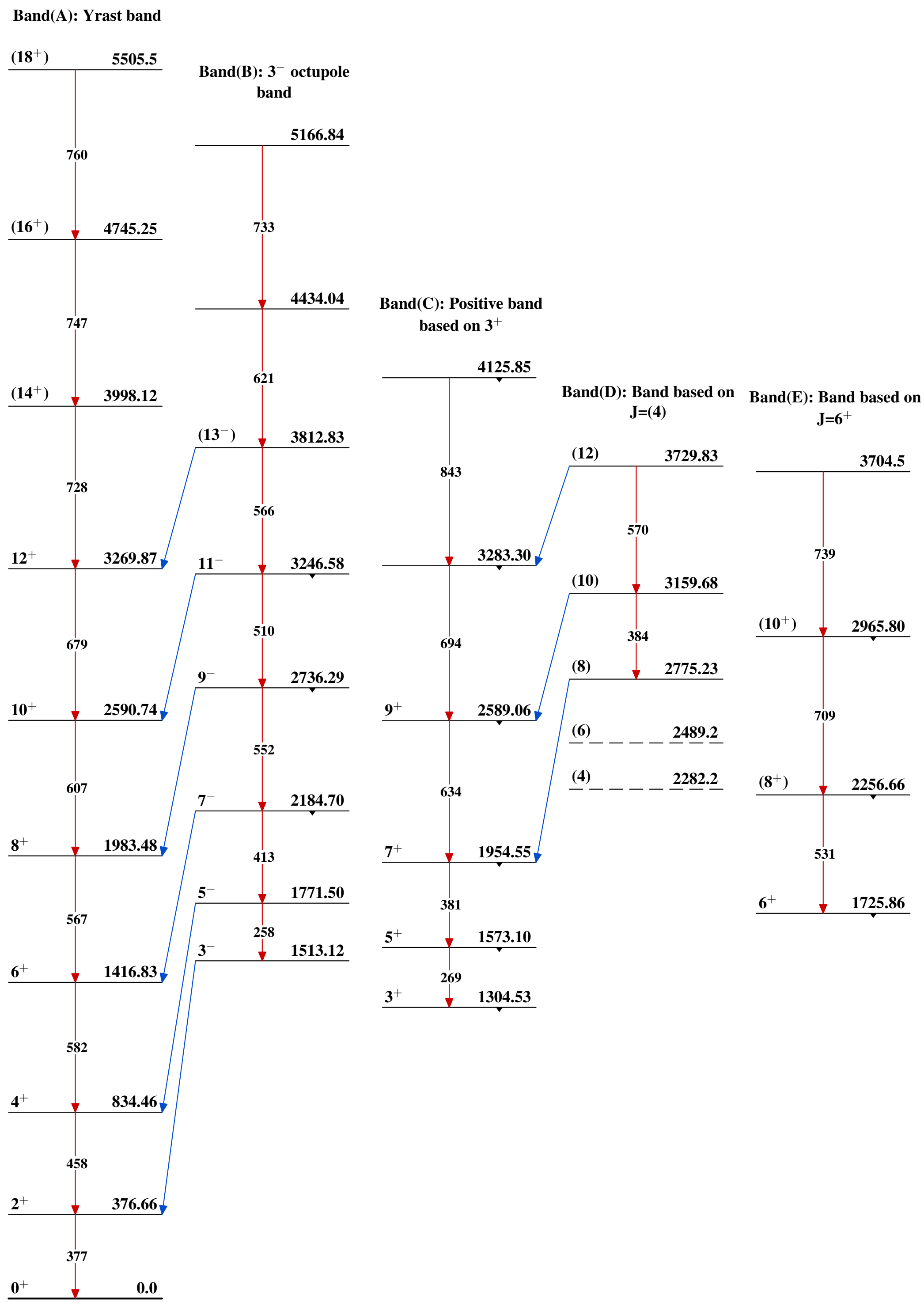
^{248}Cm SF decay 2016Ur01,2003Ur02,1996Be06

Level Scheme (continued)

Intensities: Relative I_γ



^{248}Cm SF decay 2016Ur01,2003Ur02,1996Be06



$^{140}_{54}Xe_{86}$