$^{238}U(\gamma,\gamma')$ 2012Ha12

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. Browne, J. K. Tuli	NDS 127, 191 (2015)	1-Jun-2014

Additional information 1.

Nuclear resonance fluorescence (NRF) experiment performed with 100% linearly-polarized photon beams with energies of 2.0-6.2 MeV at the HIγS facility. Beams created through Compton backscattering of free-electron-laser photons. Gamma rays detected with HPGe detectors. Measured Eγ, Iγ, angular distribution, polarization. Deduced levels, J, π, widths, B(E1), B(M1) values.

Others: 2014Gu04, 1983Zu04, 1983Ru03, 1978Ka29.

^{238}U Levels

E(level)	J^{π}[#]	Γ_0^2/Γ[@cd]	I_s eVb[e]	Comments
0.0	0^+			
44.90	2^+			E(level),J^{π}: from Adopted Levels.
680.1[†]	1^-[‡]			
731.9[†]	3^-[‡]			
927	0^+[‡]			
931	1^-[‡]			
951	2^-[‡]			
966	2^+[‡]			
998	3^-[‡]			
1037	2^+[‡]			
1059	3^+[‡]			
1061	2^+[‡]			
1129	2^-[‡]			
1782	1[&]	33 fs *4*	21.9 *25*	Γ_0^2/Γ: From $\Gamma(\gamma_0)$ and branching (1995Zi02).
1793	1[&]	80 fs *+40−20*	5.1 *10*	Γ_0^2/Γ: From $\Gamma(\gamma_0)$ and branching (1995Zi02).
1846	1[&]	31 fs *4*	23.0 *26*	Γ_0^2/Γ: From $\Gamma(\gamma_0)$ and branching (1995Zi02).
1996.7 *3*	1^-	2.8×10^{-3} eV *3*	7.0 *8*	
2017.7 *4*	1^+	1.5×10^{-3} eV *3*	2.6 *6*	
2079.3 *4*	1^+	2.4×10^{-3} eV *5*	6 *1*	
2080.7 *4*	1^-	8×10^{-3} eV *1*	14 *2*	Γ_0^2/Γ: Γ_0^2/Γ =≈5×10^{-3} eV (2011Qu01).
2093.3 *4*	1^-	3.1×10^{-3} eV *6*	7 *1*	
2145.6 *3*	1^-	3.6×10^{-3} eV *6*	8 *1*	
2175.8 *3*	1^+[a]	24×10^{-3} eV *1*	40 *2*	Γ_0^2/Γ: Γ_0^2/Γ = 31×10^{-3} eV *5* (2011Qu01).
2208.8 *3*	1^+[a]	18×10^{-3} eV *1*	29 *2*	Γ_0^2/Γ: Γ_0^2/Γ = 31×10^{-3} eV *6* (2011Qu01).
2244.4 *3*	1^+[a]	14.2×10^{-3} eV *8*	27 *2*	Γ_0^2/Γ: Γ_0^2/Γ = 23×10^{-3} eV *7* (2011Qu01).
2294.1 *3*	1^+[a]	4.0×10^{-3} eV *5*	6.6 *9*	Γ_0^2/Γ: Γ_0^2/Γ = 7×10^{-3} eV *1* (2011Qu01).
2332.7 *3*	1^-	5.4×10^{-3} eV *9*	10 *2*	
2365.6 *3*	1^-	23×10^{-3} eV *3*	44 *6*	
2410.0 *3*	1^+[a]	11×10^{-3} eV *1*	18 *2*	Γ_0^2/Γ: Γ_0^2/Γ =≈10×10^{-3} eV (2011Qu01).
2422.8 *3*	1^-	6.2×10^{-3} eV *7*	12 *1*	
2467.8 *5*	1^+[a]	48×10^{-3} eV *5*	80 *8*	Γ_0^2/Γ: Γ_0^2/Γ =≈24×10^{-3} eV (2011Qu01).
2491.5 *5*	1^-	5.2×10^{-3} eV *8*	9 *1*	
2499.4 *3*	1^+	20×10^{-3} eV *1*	32 *2*	
2529.0 *3*	1^-	7×10^{-3} eV *1*	12 *2*	
2593.7 *6*	1^-	4.1×10^{-3} eV *4*	6.6 *7*	
2602.5 *4*	1^-	1.9×10^{-3} eV *2*	3.1 *3*	
2638.3 *3*	1^+	7.3×10^{-3} eV *7*	10 *1*	
2647.3 *8*	1^+	18×10^{-3} eV *1*	25 *2*	
2702.2 *3*	1^+	10×10^{-3} eV *1*	16 *2*	
2738.9 *9*	1^+	8×10^{-3} eV *2*	11 *3*	

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$^{238}U(\gamma,\gamma')$ 2012Ha12 (continued)

^{238}U Levels (continued)

E(level)	J^{π}[#]	Γ_0^2/Γ[@cd]	I_s eVb[e]	Comments
2756.4 *3*	1^+	5×10^{-3} eV *1*	7 *2*	
2773.0 *3*	1^+	6×10^{-3} eV *1*	8 *1*	
2816.8 *4*	1^+	19×10^{-3} eV *4*	26 *5*	
2844.2 *9*	1^-	2.6×10^{-3} eV *4*	3.5 *5*	
2862.2 *5*	1^-	3.6×10^{-3} eV *4*	4.3 *5*	
2877.1 *3*	1^-	3.1×10^{-3} eV *4*	4.1 *6*	
2881.4 *5*	1^+	2.3×10^{-3} eV *5*	2.8 *6*	
2896.6 *3*	1^-	4.4×10^{-3} eV *6*	5.4 *8*	
2908.9 *3*	1^-	6.2×10^{-3} eV *8*	7.5 *9*	
2910.0 *4*	1^-	11×10^{-3} eV *1*	11 *1*	
2932.6 *6*	1^+	2.5×10^{-3} eV *5*	2.8 *6*	
2951.2 *3*	1^+	5.7×10^{-3} eV *5*	6.8 *5*	
2963.9 *8*	1^+	1.8×10^{-3} eV *4*	2.2 *5*	
3005.9 *4*	1^-	5.8×10^{-3} eV *6*	6.2 *7*	
3014.5 *3*	1^+	3.9×10^{-3} eV *7*	4.5 *8*	
3018.9 *3*	1^-	2.6×10^{-3} eV *5*	2.9 *6*	
3030.6 *3*	1^+	6.2×10^{-3} eV *6*	7.3 *7*	
3037.7 *3*	1^+	7×10^{-3} eV *1*	7 *1*	
3042.5 *6*	1^+	22×10^{-3} eV *6*	24 *6*	
3043.6 *3*	1^-	4.4×10^{-3} eV *5*	5.0 *6*	
3046.9 *3*	1^-	22×10^{-3} eV *3*	5.0 *6*	
3051.7 *3*	1^-	7.2×10^{-3} eV *6*	7.8 *7*	
3057.1 *4*	1^-	14×10^{-3} eV *1*	15 *2*	
3060.6 *3*	1^-	7×10^{-3} eV *1*	7 *1*	
3086.7 *5*	1^-	4.5×10^{-3} eV *9*	4.8 *9*	
3091.0 *3*	1^-	7×10^{-3} eV *1*	8 *1*	
3094.2 *3*	1^-	7.8×10^{-3} eV *7*	7.2 *8*	
3096.4 *3*	1^-	13×10^{-3} eV *2*	11 *1*	
3101.7 *4*	1^-	3.7×10^{-3} eV *7*	3.8 *7*	
3117.7 *4*	1^-	9×10^{-3} eV *2*	8 *2*	
3135.0 *3*	1^+	4.9×10^{-3} eV *8*	5.1 *9*	
3153.7 *3*	1^+	4.8×10^{-3} eV *6*	5.0 *6*	
3172.9 *3*	1^+	2.0×10^{-3} eV *3*	1.9 *3*	
3207.8 *4*	1^-	2.8×10^{-3} eV *6*	2.8 *5*	
3217.6 *6*	1^+	2.5×10^{-3} eV *5*	2.6 *5*	
3234.5 *7*	1^+	4.1×10^{-3} eV *8*	3.8 *8*	
3239.6 *3*	1^-	4.0×10^{-3} eV *9*	3.6 *8*	
3253.394 *15*	1	0.24 ps *8*		J^{π}: from $\gamma(\theta)$ (1981Mu05). E(level): from line shape analysis using $E\gamma(^{56}Co$ source)=3253.417 *14* (1981Mu05). Γ_0^2/Γ: from σ, with $\Gamma_{\gamma0}/\Gamma$=0.25 *5*. Value is from 1982Ru03, and corresponds to $\Gamma_{\gamma0}=5.2\times10^{-4}$ eV *19*. The earlier publication, 1981Mu05, gives $\Gamma_{\gamma0}=4.9\times10^{-4}$ eV *18* and $T_{1/2}$=0.23 ps *8*.
3274.4 *3*	1^-	9×10^{-3} eV *2*	7 *1*	
3297.2 *4*	1^-	7×10^{-3} eV *1*	6 *1*	
3303.6 *3*	1^-	3.5×10^{-3} eV *5*	2.5 *4*	
3307.32 *3*	1^+	10×10^{-3} eV *1*	9 *1*	
3329.1 *6*	1^-	9×10^{-3} eV *1*	7 *1*	
3348.33 *3*	1^+	13×10^{-3} eV *2*	6.3 *8*	
3366.0 *5*	1^+	8×10^{-3} eV *1*	6 *1*	
3384.3 *3*	1^-	13×10^{-3} eV *2*	10 *2*	
3397.9 *8*	1^-	12×10^{-3} eV *2*	10 *1*	
3416.0 *4*	1^-	12×10^{-3} eV *2*	2.7 *6*	
3421.5 *5*	1^-	3.5×10^{-3} eV *6*	3.0 *6*	

$^{238}U(\gamma,\gamma')$ 2012Ha12 (continued)

^{238}U Levels (continued)

E(level)	J^{π}[#]	Γ_0^2/Γ[@cd]	I_s eVb[e]	Comments
3441.0 *9*	1^-	6×10^{-3} eV *1*	6 *1*	

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$^{238}U(\gamma,\gamma')$ 2012Ha12 (continued)

^{238}U Levels (continued)

E(level)	J^{π}[#]	Γ_0^2/Γ[@cd]	I_s eVb[e]	Comments
3448.3 *6*	1^+	5×10^{-3} eV *1*	4 *1*	
3454.1 *4*	1^-	7×10^{-3} eV *2*	3 *1*	
3460.7 *3*	1^+	8×10^{-3} eV *1*	6.4 *8*	
3467.8 *6*	1^-	10×10^{-3} eV *1*	9 *1*	
3470.7 *3*	1^-	9×10^{-3} eV *2*	7 *2*	
3475.2 *3*	1^-	10×10^{-3} eV *2*	7 *2*	
3479.0 *3*	1^-	14×10^{-3} eV *1*	12 *1*	
3489.0 *3*	1^-	24×10^{-3} eV *7*	13 *4*	
3500.5 *3*	1^-	16×10^{-3} eV *2*	14 *2*	
3509.1 *9*	1^-	18×10^{-3} eV *4*	12 *3*	
3528.0 *4*	1^-	5.5×10^{-3} eV *8*	4.8 *7*	
3548.0 *6*	1^-	7×10^{-3} eV *1*	5.7 *8*	
3562.8 *3*	1^-	6.8×10^{-3} eV *8*	5.4 *6*	
3594.9 *5*	1^-	8×10^{-3} eV *1*	6.4 *8*	
3608.7 *3*	1^-	14×10^{-3} eV *1*	12 *1*	
3615.9 *3*	1^-	5.1×10^{-3} eV *7*	3.7 *5*	
3623.9 *3*	1^-	4.5×10^{-3} eV *6*	3.4 *4*	
3640.1 *3*	1^-	4.5×10^{-3} eV *7*	3.5 *6*	
3650.5 *3*	1^-	11×10^{-3} eV *1*	8.2 *9*	
3659.7 *6*	1^-	4.4×10^{-3} eV *7*	3.5 *5*	
3673.7 *6*	1^-	5.8×10^{-3} eV *9*	4.1 *7*	
3728.0 *9*	1^-	5×10^{-3} eV *1*	4 *1*	
3738.5 *8*	1^-	18×10^{-3} eV *2*	13 *2*	
3759.9 *3*	1^-	23×10^{-3} eV *2*	16 *2*	
3805.1 *3*	1^-	26×10^{-3} eV *2*	18 *2*	
3809	$(1,2^+)$			$\Gamma_{\gamma0}\geq1.6\times10^{-3}$ eV.
3819.0 *6*	1^-	16×10^{-3} eV *2*	11 *1*	
3828.7 *3*	1^-	7×10^{-3} eV *1*	5.2 *8*	
3965.7 *4*	1^-	18×10^{-3} eV *3*	10 *2*	
3990.7 *9*	1^-	9.5×10^{-3} eV *8*	4.7 *4*	
3995.8 *3*	1^-	11×10^{-3} eV *2*	6 *1*	
4023.7 *7*	1^-	10×10^{-3} eV *2*	5 *1*	
4031.4 *7*	1^-	15×10^{-3} eV *2*	7.5 *8*	
4046.7 *3*	1^-	11×10^{-3} eV *2*	5.0 *8*	
4065.3 *3*	1^-	9×10^{-3} eV *2*	3.8 *7*	
4072.1 *6*	1^-	14×10^{-3} eV *2*	8 *1*	
4088.9 *7*	1^-	7×10^{-3} eV *1*	3.3 *5*	
4093.4 *3*	1^-	15×10^{-3} eV *2*	8.4 *7*	
4100.2 *3*	1^-	10×10^{-3} eV *1*	4.1 *4*	
4105.2 *3*	1^-	6.5×10^{-3} eV *8*	3.9 *5*	
4122.9 *5*	1^-	7×10^{-3} eV *2*	3.7 *9*	
4138.9 *7*	1^-	10×10^{-3} eV *1*	5.2 *6*	
4145.8 *3*	1^-	6×10^{-3} eV *1*	2.7 *5*	
4151.3 *6*	1^-	7×10^{-3} eV *2*	3.3 *9*	
4155.4 *3*	1^-	20×10^{-3} eV *4*	12 *2*	
4175.8 *4*	1^-	21×10^{-3} eV *3*	11 *2*	
4181.5 *7*	1^-	16×10^{-3} eV *3*	7 *1*	
4217.3 *8*	1^-	12×10^{-3} eV *2*	5 *1*	
4239.1 *3*	1^-	26×10^{-3} eV *3*	14 *2*	
4495	$(1,2^+)$			$\Gamma_{\gamma0}\geq4.7\times10^{-5}$ eV.
4592	$(1,2^+)$			$IG_{\gamma0}\geq2.8\times10^{-4}$ eV.
4807	1[b]			$\Gamma_{\gamma0}=2.5\times10^{-4}$ eV *5*.
5140?				

^{238}U(γ,γ') 2012Ha12 (continued)

^{238}U Levels (continued)

E(level)	J$^{\pi}$[#]	Γ_0^2/Γ[@cd]	I_s eVb[e]	Comments
5206	(1,2$^+$)			$\Gamma_{\gamma 0} \geq 4.1\times10^{-4}$ eV.

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^{238}U(γ,γ') 2012Ha12 (continued)

^{238}U Levels (continued)

E(level)	J^{π}[#]
5666?	(1,2$^+$)
5843?	(1,2$^+$)

[†] Rounded-off value from Adopted Levels.
[‡] From Adopted Levels.
[#] J^{π} for levels directly excited in (γ,γ') will have J=1 or J^{π}=2$^+$.
[@] Additional information 2.
[&] From $\gamma(\theta)$ (1995Zi02).
[a] From $\gamma(\theta)$ in (γ,γ') and form factor in (e,e′) (1988He02).
[b] From $\gamma(\theta)$ (1982Ru03).
[c] From 1982Ru03,
[d] 1988He02 give $\Gamma^2_{\gamma0}/\Gamma$ and $\Gamma_{\gamma1}/\Gamma_{\gamma0}$ from 1982Ru03. Although not explicitly stated in the paper, the authors have allowed for possible branchings to higher levels by writing Γ=(1.05 *5*)$\Gamma_{\gamma0}$+$\Gamma_{\gamma1}$, and have used this expression in deducing their B(M1) and $\Gamma_{\gamma0}$ values (private communication from the second author).The basis for introducing this 5% term is given in Phys. Lett. 149B, 59 (1984), Nucl. Phys. A492, 411 (1989), and Ann. of Phys. 171, 253 (1986). The evaluators have included this additional branching in deducing the total Γ and B(M1)(W.u.) values.
[e] Integrated cross section (2012Ha12).

γ(^{238}U)

B(E1) and B(M1) values listed here with the ground state transitions are from 0$^+$,g.s. to excited 1$^-$ and 1$^+$, respectively, i.e. “up” values.

E_i(level)	J^{π}_i	E_{γ}[‡]	I_{γ}[†]	E_f	J^{π}_f	Mult.	Comments
1782	1	1737[@]	55[@] *5*	44.90	2$^+$		
		1782[@]	100[@]	0.0	0$^+$		
1793	1	1748[@]	100[@]	44.90	2$^+$		
		1793[@]	90[@] *23*	0.0	0$^+$		
1846	1	1802[@]	51[@] *5*	44.90	2$^+$		
		1846[@]	100[@]	0.0	0$^+$		
1996.7	1$^-$	1951.8	18 *2*	44.90	2$^+$		
		1996.7 *3*	100	0.0	0$^+$	[M1]	B(E1)(↑)=1.2×10^{-5} *2* R_{exp}=0.19 *2*.
2017.7	1$^+$	1972.8	187 *47*	44.90	2$^+$		
		2017.7 *4*	100	0.0	0$^+$	[M1]	B(M1)(↑)=0.14 *5* R_{exp}=2.0 *5*.
2079.3	1$^+$	2079.3 *4*		0.0	0$^+$		B(M1)(↑)=0.07 *2* R_{exp}=0.0 *1*.
2080.7	1$^-$	2035.8	150 *19*	44.90	2$^+$		
		2080.7 *4*	100	0.0	0$^+$	[E1]	B(E1)(↑)=6×10^{-5} *1* R_{exp}=1.6 *2*.
2093.3	1$^-$	2093.3 *4*		0.0	0$^+$	[E1]	B(E1)(↑)=1.0×10^{-5} *2* R_{exp}=0.0 *1*.
2145.6	1$^-$	2145.6 *3*		0.0	0$^+$	[E1]	B(E1)(↑)=1.1×10^{-5} *2* R_{exp}=0.0 *1*.
2175.8	1$^+$	2130.9[&]	54[&] *3*	44.90	2$^+$		
		2175.8[&] *3*	100[&]	0.0	0$^+$	[M1]	B(M1)(↑)=0.96 *8* R_{exp}=0.57 *3*.
2208.8	1$^+$	2163.9[&] *3*	21[&] *8*	44.90	2$^+$		
		2208.8[&] *3*	100[&]	0.0	0$^+$	[M1]	B(M1)(↑)=0.7 *1* R_{exp}=0.22 *8*.
2244.4	1$^+$	2199.5[&]	14[&] *1*	44.90	2$^+$		
		2244.4[&] *3*	100[&]	0.0	0$^+$	[M1]	B(M1)(↑)=0.41 *3* R_{exp}=0.15 *1*.

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^{238}U(γ,γ′) 2012Ha12 (continued)

γ(^{238}U) (continued)

E_i(level)	J^π_i	E_γ[‡]	I_γ[†]	E_f	J^π_f	Mult.	Comments
2294.1	1+	2249.2[&]	103[&] 6	44.90	2+		
		2294.1[&] 3	100[&]	0.0	0+	[M1]	B(M1)(↑)=0.18 3 R_{exp}=1.09 6.
2332.7	1−	2287.8	132 9	44.90	2+		
		2332.7 3	100	0.0	0+	[E1]	B(E1)(↑)=2.6×10^{-5} 5 R_{exp}=1.4 1.
2365.6	1−	2365.6 3		0.0	0+	[E1]	B(E1)(↑)=5.1×10^{-5} 7 R_{exp}=0.0 1.
2410.0	1+	2365.1[&]	170[&] 9	44.90	2+		
		2410.0[&] 3	100[&]	0.0	0+	[M1]	B(M1)(↑)=0.61 7 R_{exp}=1.8 1.
2422.8	1−	2422.8 3		0.0	0+	[E1]	B(E1)(↑)=1.2×10^{-5} 1 R_{exp}=0.0 1.
2467.8	1+	2467.8 5		0.0	0+	[M1]	B(M1)(↑)=0.83 8 R_{exp}=0.0 1.
2491.5	1−	2446.6	66 28	44.90	2+		
		2491.5 5	100	0.0	0+	[E1]	B(E1)(↑)=1.6×10^{-5} 8 R_{exp}=0.7 3.
2499.4	1+	2454.5	47 5	44.90	2+		
		2499.4 3	100	0.0	0+	[M1]	B(M1)(↑)=0.48 4 R_{exp}=0.50 5.
2529.0	1−	2484.1	28 9	44.90	2+		
		2529.0 3	100	0.0	0+	[E1]	B(E1)(↑)=1.8×10^{-5} 5 R_{exp}=0.3 1.
2593.7	1−	2548.8	17 4	44.90	2+		
		2593.7 6	100	0.0	0+	[E1]	B(E1)(↑)=0.8×10^{-5} 2 R_{exp}=0.18 4.
2602.5	1−	2557.6	38 9	44.90	2+		
		2602.5 4	100	0.0	0+	[E1]	B(E1)(↑)=0.4×10^{-5} 1 R_{exp}=0.4 1.
2638.3	1+	2593.4	133 9	44.90	2+		
		2638.3 3	100	0.0	0+	[M1]	B(M1)(↑)=0.25 3 R_{exp}=1.4 1.
2647.3	1+	2602.4	80 8	44.90	2+		
		2647.3 8	100	0.0	0+	[M1]	B(M1)(↑)=0.46 5 R_{exp}=0.84 8.
2702.2	1+	2702.2 3		0.0	0+	[M1]	B(M1)(↑)=0.14 2 R_{exp}=0.0 1.
2738.9	1+	2694.0	143 48	44.90	2+		
		2738.9 9	100	0.0	0+	[M1]	B(M1)(↑)=0.3 1 R_{exp}=1.5 5.
2756.4	1+	2756.4 3		0.0	0+	[M1]	B(M1)(↑)=0.06 1 R_{exp}=0.0 1.
2773.0	1+	2728.1 3	105 29	44.90	2+		
		2773.0 3	100	0.0	0+	[M1]	B(M1)(↑)=0.16 5 R_{exp}=1.1 3.
2816.8	1+	2816.8 4		0.0	0+	[M1]	B(M1)(↑)=0.22 4 R_{exp}=0.0 1.
2844.2	1−	2844.2 9		0.0	0+	[E1]	B(E1)(↑)=0.33×10^{-5} 4 R_{exp}=0.0 1.
2862.2	1−	2817.3	143 29	44.90	2+		
		2862.2 5	100	0.0	0+	[E1]	B(E1)(↑)=1.1×10^{-5} 2 R_{exp}=1.5 3.
2877.1	1−	2877.1 3		0.0	0+	[E1]	B(E1)(↑)=0.37×10^{-5} 6 R_{exp}=0.0 1.
2881.4	1+	2836.5	134 29	44.90	2+		
		2881.4 5	100	0.0	0+	[M1]	B(M1)(↑)=0.06 2 R_{exp}=1.4 3.
2896.6	1−	2851.7	76 19	44.90	2+		
		2896.6 3	100	0.0	0+	[E1]	B(E1)(↑)=0.9×10^{-5} 3 R_{exp}=0.8 2.
2908.9	1−	2864.0	76 19	44.90	2+		
		2908.9 3	100	0.0	0+	[E1]	B(E1)(↑)=1.3×10^{-5} 3 R_{exp}=0.8 2.
2910.0	1−	2865.1	105 10	44.90	2+		
		2910.0 4	100	0.0	0+	[E1]	B(E1)(↑)=2.6×10^{-5} 4 R_{exp}=1.1 1.
2932.6	1+	2887.7	143 38	44.90	2+		
		2932.6 6	100	0.0	0+	[M1]	B(M1)(↑)=0.06 2 R_{exp}=1.5 4.
2951.2	1+	2906.3	86 10	44.90	2+		
		2951.2 3	100	0.0	0+	[M1]	B(M1)(↑)=0.12 2 R_{exp}=0.9 1.
2963.9	1+	2963.9 8		0.0	0+	[M1]	B(M1)(↑)=0.02 1 R_{exp}=0.0 1.
3005.9	1−	2961.0	67 76	44.90	2+		
		3005.9 4	100	0.0	0+	[E1]	B(E1)(↑)=1.0×10^{-5} 2 R_{exp}=0.7 8.
3014.5	1+	2969.6	38 10	44.90	2+		
		3014.5 3	100	0.0	0+	[M1]	B(M1)(↑)=0.05 2 R_{exp}=0.4 1.
3018.9	1−	2974.0	96 29	44.90	2+		
		3018.9 3	100	0.0	0+	[E1]	B(E1)(↑)=0.6×10^{-5} 2 R_{exp}=1.0 3.
3030.6	1+	3030.6 3		0.0	0+	[M1]	B(M1)(↑)=0.06 1 R_{exp}=0.0 1.
3037.7	1+	2992.8	115 19	44.90	2+		

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^{238}U(γ,γ′) 2012Ha12 (continued)

γ(^{238}U) (continued)

E_i(level)	J^π_i	E_γ[‡]	I_γ[†]	E_f	J^π_f	Mult.	Comments
3037.7	1+	3037.7 3	100	0.0	0+	[M1]	B(M1)(↑)=0.15 3 R_{exp}=1.2 2.
3042.5	1+	3042.5 6		0.0	0+	[M1]	B(M1)(↑)=0.20 4 R_{exp}=0.0 1.
3043.6	1−	3043.6 3	100	0.0	0+	[E1]	B(E1)(↑)=0.40×10^{-5} 7 R_{exp}=0.1 9.
3046.9	1−	3046.9 3		0.0	0+	[E1]	B(E1)(↑)=2.2×10^{-5} 3 R_{exp}=0.0 1.
3051.7	1−	3006.8	67 10	44.90	2+		
		3051.7 3	100	0.0	0+	[E1]	B(E1)(↑)=1.4×10^{-5} 2 R_{exp}=0.7 1.
3057.1	1−	3012.2	3 1	44.90	2+		
		3057.1 4	100	0.0	0+	[E1]	B(E1)(↑)=1.9×10^{-5} 2 R_{exp}=0.03 1.
3060.6	1−	3015.7	55 5	44.90	2+		
		3060.6 3	100	0.0	0+	[E1]	B(E1)(↑)=1.1×10^{-5} 2 R_{exp}=0.58 5.
3086.7	1−	3041.8	28 3	44.90	2+		
		3086.7 5	100	0.0	0+	[E1]	B(E1)(↑)=0.6×10^{-5} 1 R_{exp}=0.29 3.
3091.0	1−	3046.1 4	23 2	44.90	2+		
		3091.0 4	100	0.0	0+	[E1]	B(E1)(↑)=0.9×10^{-5} 1 R_{exp}=0.24 2.
3094.2	1−	3049.3	134 19	44.90	2+		
		3094.2 3	100	0.0	0+	[E1]	B(E1)(↑)=1.8×10^{-5} 2 R_{exp}=1.4 2.
3096.4	1−	3051.5	105 29	44.90	2+		
		3096.4 3	100	0.0	0+	[E1]	B(E1)(↑)=2.8×10^{-5} 4 R_{exp}=1.1 3.
3101.7	1−	3056.8	62 6	44.90	2+		
		3101.7 4	100	0.0	0+	[E1]	B(E1)(↑)=0.6×10^{-5} 2 R_{exp}=0.65 6.
3117.7	1−	3072.8	96 10	44.90	2+		
		3117.7 4	100	0.0	0+	[E1]	B(E1)(↑)=1.7×10^{-5} 4 R_{exp}=1.0 1.
3135.0	1+	3090.1	86 29	44.90	2+		
		3135.0 3	100	0.0	0+	[M1]	B(M1)(↑)=0.08 3 R_{exp}=0.9 3.
3153.7	1+	3108.8	37 5	44.90	2+		
		3153.7 3	100	0.0	0+	[M1]	B(M1)(↑)=0.08 2 R_{exp}=0.39 5.
3172.9	1+	3128.0	105 10	44.90	2+		
		3172.9 3	100	0.0	0+	[M1]	B(M1)(↑)=0.06 1 R_{exp}=1.1 1.
3207.8	1−	3162.9	40 6	44.90	2+		
		3207.8 4	100	0.0	0+	[E1]	B(E1)(↑)=0.5×10^{-5} 1 R_{exp}=0.42 6.
3217.6	1+	3172.7	58 19	44.90	2+		
		3217.6 6	100	0.0	0+	[M1]	B(M1)(↑)=0.03 1 R_{exp}=0.6 2.
3234.5	1+	3189.6	163 38	44.90	2+		
		3234.5 7	100	0.0	0+		B(M1)(↑)=0.09 3 [M1] R_{exp}=1.7 4.
3239.6	1−	3194.7	249 67	44.90	2+		
		3239.6 3	100	0.0	0+	[E1]	B(E1)(↑)=1.2×10^{-5} 4 R_{exp}=2.6 7.
3253.394	1	2125[#]	44[#]	1129	2−		
		2217[#]	9[#]	1037	2+		
		2256[#]	8[#]	998	3−		
		2288[#]	91[#]	966	2+		
		2303[#]	16[#]	951	2−		
		2323[#]	32[#]	931	1−		
		2327[#]	33[#]	927	0+		
		2522[#]	14[#]	731.9	3−		
		2574[#]	28[#]	680.1	1−		
		3209[#]	22[#]	44.90	2+		
		3254	100	0.0	0+		
3274.4	1−	3229.5	86 10	44.90	2+		
		3274.4 3	100	0.0	0+	[E1]	B(E1)(↑)=1.5×10^{-5} 3 R_{exp}=0.9 1.
3297.2	1−	3297.2 4		0.0	0+	[E1]	B(E1)(↑)=0.53×10^{-5} 9 R_{exp}=0.0 1.
3303.6	1−	3258.7	106 10	44.90	2+		
		3303.6 3	100	0.0	0+	[E1]	B(E1)(↑)=0.6×10^{-5} 1 R_{exp}=1.1 1.
3307.32	1+	3262.4	58 19	44.90	2+		

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^{238}U(γ,γ′) 2012Ha12 (continued)

γ(^{238}U) (continued)

E_i(level)	J^π_i	E_γ‡	I_γ†	E_f	J^π_f	Mult.	Comments
3307.32	1+	3307.3 *3*	100	0.0	0+	[M1]	B(M1)(↑)=0.11 *4* R_{exp}=0.6 *2*.
3329.1	1−	3284.2	85 *9*	44.90	2+		
		3329.1 *6*	100	0.0	0+	[E1]	B(E1)(↑)=1.4×10^{-5} *2* R_{exp}=0.89 *9*.
3348.33	1+	3303.4	192 *19*	44.90	2+		
		3348.3 *3*	100	0.0	0+	[M1]	B(M1)(↑)=0.23 *4* R_{exp}=2.0 *2*.
3366.0	1+	3321.1	53 *6*	44.90	2+		
		3366.0 *5*	100	0.0	0+	[M1]	B(M1)(↑)=0.08 *2* R_{exp}=0.55 *6*.
3384.3	1−	3339.4	41 *5*	44.90	2+		
		3384.3 *3*	100	0.0	0+	[E1]	B(E1)(↑)=1.4×10^{-5} *3* R_{exp}=0.43 *5*.
3397.9	1−	3353.0	37 *4*	44.90	2+		
		3397.9 *8*	100	0.0	0+	[E1]	B(E1)(↑)=1.3×10^{-5} *2* R_{exp}=0.38 *4*.
3416.0	1−	3371.1	384 *38*	44.90	2+		
		3416.0 *4*	100	0.0	0+	[E1]	B(E1)(↑)=2.0×10^{-5} *5* R_{exp}=4.0 *4*.
3421.5	1−	3421.5 *5*		0.0	0+	[E1]	B(E1)(↑)=0.25×10^{-5} *5* R_{exp}=0.0 *1*.
3441.0	1−	3396.1	48 *19*	44.90	2+		
		3441.0 *9*	100	0.0	0+	[E1]	B(E1)(↑)=0.7×10^{-5} *2* R_{exp}=0.5 *2*.
3448.3	1+	3403.4	106 *10*	44.90	2+		
		3448.3 *6*	100	0.0	0+	[M1]	B(M1)(↑)=0.07 *2* R_{exp}=1.1 *1*.
3454.1	1−	3409.2	250 *29*	44.90	2+		
		3454.1 *4*	100	0.0	0+	[E1]	B(E1)(↑)=1.8×10^{-5} *6* R_{exp}=2.6 *3*.
3460.7	1+	3415.8	56 *7*	44.90	2+		
		3460.7 *3*	100	0.0	0+	[M1]	B(M1)(↑)=0.07 *1* R_{exp}=0.58 *7*.
3467.8	1−	3422.9	58 *10*	44.90	2+		
		3467.8 *6*	100	0.0	0+	[E1]	B(E1)(↑)=1.2×10^{-5} *3* R_{exp}=0.6 *1*.
3470.7	1−	3425.8	29 *29*	44.90	2+		
		3470.7 *3*	100	0.0	0+	[E1]	B(E1)(↑)=0.8×10^{-5} *8* R_{exp}=0.3 *3*.
3475.2	1−	3430.3	58 *29*	44.90	2+		
		3475.2 *3*	100	0.0	0+	[E1]	B(E1)(↑)=1.1×10^{-5} *7* R_{exp}=0.6 *3*.
3479.0	1−	3434.1	43 *9*	44.90	2+		
		3479.0 *3*	100	0.0	0+	[E1]	B(E1)(↑)=1.4×10^{-5} *3* R_{exp}=0.45 *9*.
3489.0	1−	3444.1	144 *58*	44.90	2+		
		3489.0 *3*	100	0.0	0+	[E1]	B(E1)(↑)=4×10^{-5} *2* R_{exp}=1.5 *6*.
3500.5	1−	3500.5 *3*		0.0	0+	[E1]	B(E1)(↑)=1.1×10^{-5} *1* R_{exp}=0.0 *1*.
3509.1	1−	3464.2	67 *19*	44.90	2+		
		3509.1 *9*	100	0.0	0+	[E1]	B(E1)(↑)=2.0×10^{-5} *7* R_{exp}=0.7 *2*.
3528.0	1−	3528.0 *4*		0.0	0+	[E1]	B(E1)(↑)=0.36×10^{-5} *5* R_{exp}=0.0 *1*.
3548.0	1−	3503.1	193 *29*	44.90	2+		
		3548.0 *6*	100	0.0	0+	[E1]	B(E1)(↑)=1.3×10^{-5} *3* R_{exp}=2.0 *3*.
3562.8	1−	3517.9	125 *29*	44.90	2+		
		3562.8 *3*	100	0.0	0+	[E1]	B(E1)(↑)=0.9×10^{-5} *2* R_{exp}=1.3 *3*.
3594.9	1−	3550.0	116 *19*	44.90	2+		
		3594.9 *5*	100	0.0	0+	[E1]	B(E1)(↑)=1.1×10^{-5} *2* R_{exp}=1.2 *2*.
3608.7	1−	3563.8	48 *8*	44.90	2+		
		3608.7 *3*	100	0.0	0+	[E1]	B(E1)(↑)=1.3×10^{-5} *2* R_{exp}=0.50 *8*.
3615.9	1−	3571.0	250 *48*	44.90	2+		
		3615.9 *3*	100	0.0	0+	[E1]	B(E1)(↑)=1.0×10^{-5} *2* R_{exp}=2.6 *5*.
3623.9	1−	3579.0	144 *29*	44.90	2+		
		3623.9 *3*	100	0.0	0+	[E1]	B(E1)(↑)=0.6×10^{-5} *1* R_{exp}=1.5 *3*.
3640.1	1−	3595.2	77 *19*	44.90	2+		
		3640.1 *3*	100	0.0	0+	[E1]	B(E1)(↑)=0.5×10^{-5} *1* R_{exp}=0.8 *2*.
3650.5	1−	3605.6	87 *10*	44.90	2+		
		3650.5 *3*	100	0.0	0+	[E1]	B(E1)(↑)=1.1×10^{-5} *2* R_{exp}=0.9 *1*.
3659.7	1−	3614.8	67 *10*	44.90	2+		
		3659.7 *6*	100	0.0	0+	[E1]	B(E1)(↑)=0.4×10^{-5} *1* R_{exp}=0.7 *1*.
3673.7	1−	3628.8	193 *39*	44.90	2+		
		3673.7 *6*	100	0.0	0+	[E1]	B(E1)(↑)=1.0×10^{-5} *3* R_{exp}=2.0 *4*.

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^{238}U(γ,γ′) 2012Ha12 (continued)

γ(^{238}U) (continued)

E_i(level)	J^{π}_i	E_{γ}[‡]	I_{γ}[†]	E_f	J^{π}_f	Mult.	Comments
3728.0	1⁻	3683.1	87 *29*	44.90	2⁺		
		3728.0 *9*	100	0.0	0⁺	[E1]	B(E1)(↑)=0.5×10^{-5} *2* R_{exp}=0.9 *3*.
3738.5	1⁻	3693.6	77 *19*	44.90	2⁺		
		3738.5 *8*	100	0.0	0⁺	[E1]	B(E1)(↑)=1.7×10^{-5} *5* R_{exp}=0.8 *2*.
3759.9	1⁻	3715.0	87 *19*	44.90	2⁺		
		3759.9 *3*	100	0.0	0⁺	[E1]	B(E1)(↑)=2.3×10^{-5} *5* R_{exp}=0.9 *2*.
3805.1	1⁻	3760.2	87 *10*	44.90	2⁺		
		3805.1 *3*	100	0.0	0⁺	[E1]	B(E1)(↑)=2.5×10^{-5} *4* R_{exp}=0.9 *1*.
3809	(1,2⁺)	2882[#]	55[#] *22*	927	0⁺		
		3128[#]	28[#] *22*	680.1	1⁻		
		3764[#]	96[#] *14*	44.90	2⁺		
		3809[#]	100[#]	0.0	0⁺		
3819.0	1⁻	3774.1	106 *19*	44.90	2⁺		
		3819.0 *6*	100	0.0	0⁺	[E1]	B(E1)(↑)=1.9×10^{-5} *4* R_{exp}=1.1 *2*.
3828.7	1⁻	3828.7 *3*		0.0	0⁺	[E1]	B(E1)(↑)=0.36×10^{-5} *5* R_{exp}=0.0 *1*.
3965.7	1⁻	3920.8	47 *4*	44.90	2⁺		
		3965.7 *4*	100	0.0	0⁺	[E1]	B(E1)(↑)=1.2×10^{-5} *2* R_{exp}=0.49 *4*.
3990.7	1⁻	3945.8	116 *10*	44.90	2⁺		
		3990.7 *9*	100	0.0	0⁺	[E1]	B(E1)(↑)=0.9×10^{-5} *1* R_{exp}=1.2 *1*.
3995.8	1⁻	3950.9	58 *39*	44.90	2⁺		
		3995.8 *3*	100	0.0	0⁺	[E1]	B(E1)(↑)=0.8×10^{-5} *1* R_{exp}=0.6 *4*.
4023.7	1⁻	3978.8	97 *10*	44.90	2⁺		
		4023.7 *7*	100	0.0	0⁺	[E1]	B(E1)(↑)=0.9×10^{-5} *2* R_{exp}=1.0 *1*.
4031.4	1⁻	3986.5	48 *10*	44.90	2⁺		
		4031.4 *7*	100	0.0	0⁺	[E1]	B(E1)(↑)=1.2×10^{-5} *3* R_{exp}=0.5 *1*.
4046.7	1⁻	4001.8	126 *39*	44.90	2⁺		
		4046.7 *3*	100	0.0	0⁺	[E1]	B(E1)(↑)=1.0×10^{-5} *4* R_{exp}=1.3 *4*.
4065.3	1⁻	4020.4	164 *39*	44.90	2⁺		
		4065.3 *3*	100	0.0	0⁺	[E1]	B(E1)(↑)=1.1×10^{-5} *3* R_{exp}=1.7 *4*.
4072.1	1⁻	4027.2	58 *10*	44.90	2⁺		
		4072.1 *6*	100	0.0	0⁺	[E1]	B(E1)(↑)=1.0×10^{-5} *2* R_{exp}=0.6 *1*.
4088.9	1⁻	4044.0	97 *29*	44.90	2⁺		
		4088.9 *7*	100	0.0	0⁺	[E1]	B(E1)(↑)=0.6×10^{-5} *2* R_{exp}=1.0 *3*.
4093.4	1⁻	4048.5	39 *4*	44.90	2⁺		
		4093.4 *3*	100	0.0	0⁺	[E1]	B(E1)(↑)=0.9×10^{-5} *1* R_{exp}=0.40 *4*.
4100.2	1⁻	4055.3	174 *19*	44.90	2⁺		
		4100.2 *3*	100	0.0	0⁺	[E1]	B(E1)(↑)=1.2×10^{-5} *2* R_{exp}=1.8 *2*.
4105.2	1⁻	4105.2 *3*		0.0	0⁺	[E1]	B(E1)(↑)=0.27×10^{-5} *3* R_{exp}=0.0 *1*.
4122.9	1⁻	4078.0	81 *9*	44.90	2⁺		
		4122.9 *5*	100	0.0	0⁺	[E1]	B(E1)(↑)=0.6×10^{-5} *2* R_{exp}=0.84 *9*.
4138.9	1⁻	4094.0	40 *7*	44.90	2⁺		
		4138.9 *7*	100	0.0	0⁺	[E1]	B(E1)(↑)=0.5×10^{-5} *1* R_{exp}=0.41 *7*.
4145.8	1⁻	4100.9	58 *58*	44.90	2⁺		
		4145.8 *3*	100	0.0	0⁺	[E1]	B(E1)(↑)=0.7×10^{-5} *1* R_{exp}=0.6 *6*.
4151.3	1⁻	4106.4	97 *29*	44.90	2⁺		
		4151.3 *6*	100	0.0	0⁺	[E1]	B(E1)(↑)=0.5×10^{-5} *2* R_{exp}=1.0 *3*.
4155.4	1⁻	4155.4 *3*		0.0	0⁺	[E1]	B(E1)(↑)=0.8×10^{-5} *2* R_{exp}=0.0 *1*.
4175.8	1⁻	4130.9	27 *3*	44.90	2⁺		
		4175.8 *4*	100	0.0	0⁺	[E1]	B(E1)(↑)=1.1×10^{-5} *2* R_{exp}=0.28 *3*.
4181.5	1⁻	4136.6	97 *10*	44.90	2⁺		
		4181.5 *7*	100	0.0	0⁺	[E1]	B(E1)(↑)=1.2×10^{-5} *3* R_{exp}=1.0 *1*.
4217.3	1⁻	4172.4	107 *10*	44.90	2⁺		
		4217.3 *8*	100	0.0	0⁺	[E1]	B(E1)(↑)=0.9×10^{-5} *2* R_{exp}=1.1 *1*.
4239.1	1⁻	4239.1 *3*		0.0	0⁺	[E1]	B(E1)(↑)=1.0×10^{-5} *1* R_{exp}=0.0 *1*.

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$^{238}U(\gamma,\gamma')$ 2012Ha12 (continued)

$\gamma(^{238}U)$ (continued)

E_i(level)	J_i^π	E_γ ‡	I_γ †	E_f	J_f^π	Mult.	Comments
4495	(1,2+)	4450#a	32# 28	44.90	2+		
		4495#	100#	0.0	0+	[E1]	
4592	(1,2+)	4546#	19×10[1]# 11	44.90	2+		
		4592#	100#	0.0	0+		
4807	1	3840#	47# 17	966	2+		
		4807#	100#	0.0	0+		
5140?		5140a		0.0	0+		
5206	(1,2+)	4148#a	33# 26	1059	3+		
		5160#	90# 28	44.90	2+		
		5206	100	0.0	0+		
5666?	(1,2+)	5666a		0.0	0+		E_γ: From 1982Ru03.
5843?	(1,2+)	5843a		0.0	0+		E_γ: From 1982Ru03.

† Deduced by the evaluators from $R_{exp}=(\Gamma_1/\Gamma_0)(E_0/E_1)^3$, where R_{exp} values are listed in 2012Ha12 and in comments with ground-state transitions in this dataset, unless otherwise specified.
‡ From 2012Ha12, except where noted otherwise; or deduced by evaluators from data in 2012Ha12.
\# Energy and relative photon branching from each level are from 1982Ru03. Data for the 3253 level are also given in 1981Mu05, an earlier publication by the same group.
@ From 1995Zi02.
& Other:1988He02.
a Placement of transition in the level scheme is uncertain.

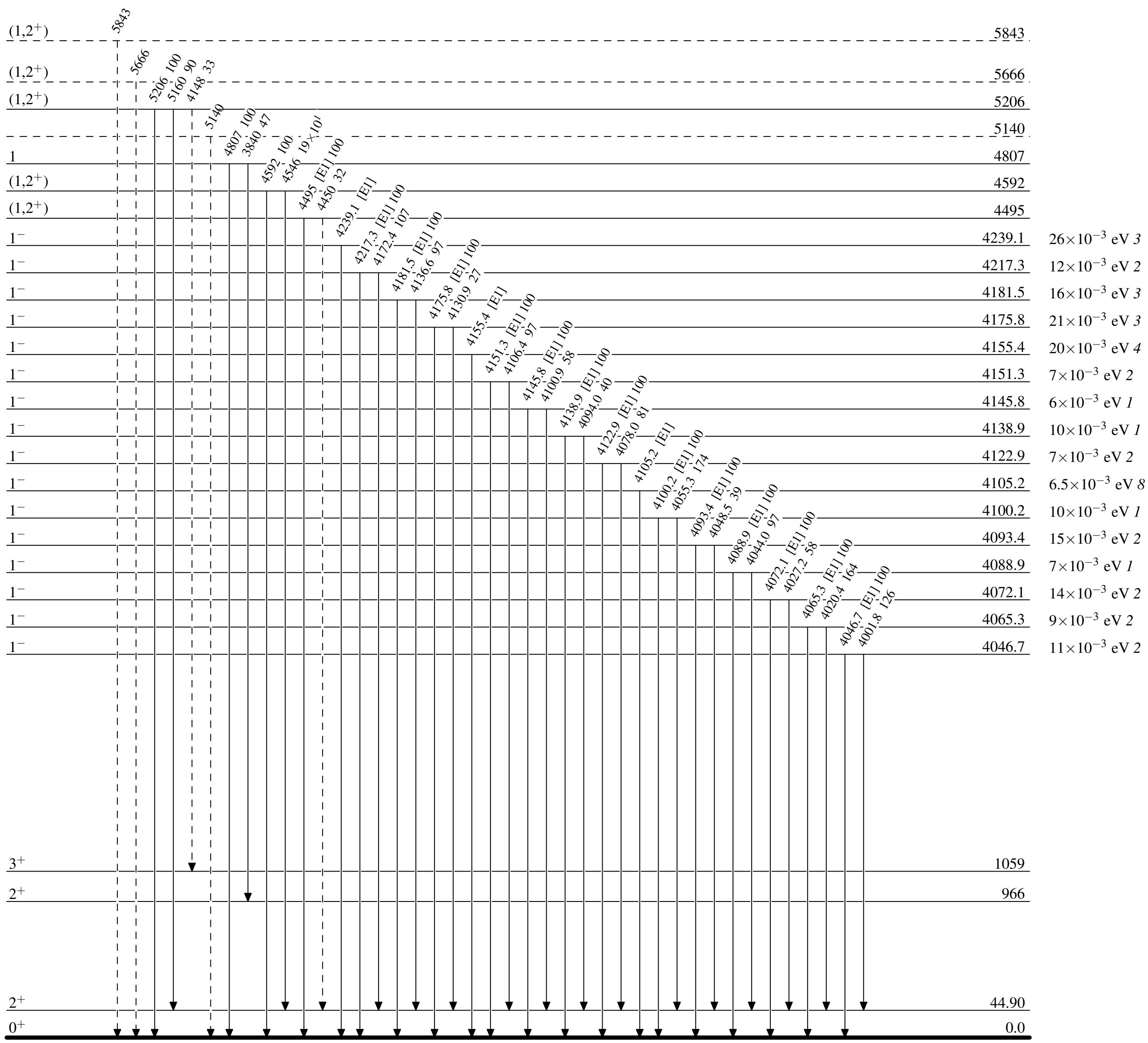
^{238}U(γ,γ′) 2012Ha12

Legend

Level Scheme

Intensities: Relative photon branching from each level

γ Decay (Uncertain)

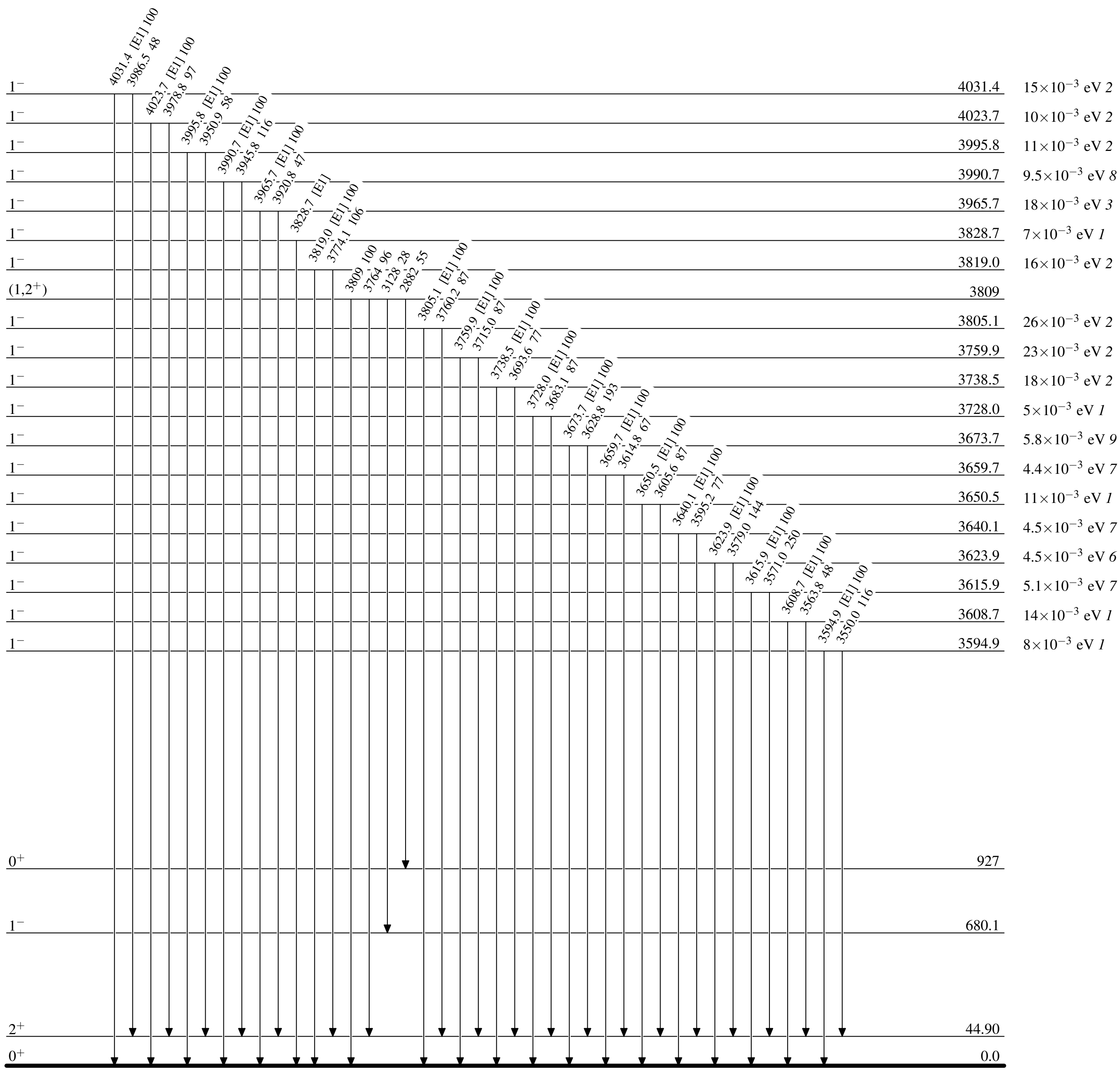


$^{238}_{92}U_{146}$

$^{238}U(\gamma,\gamma')$ 2012Ha12

Level Scheme (continued)

Intensities: Relative photon branching from each level

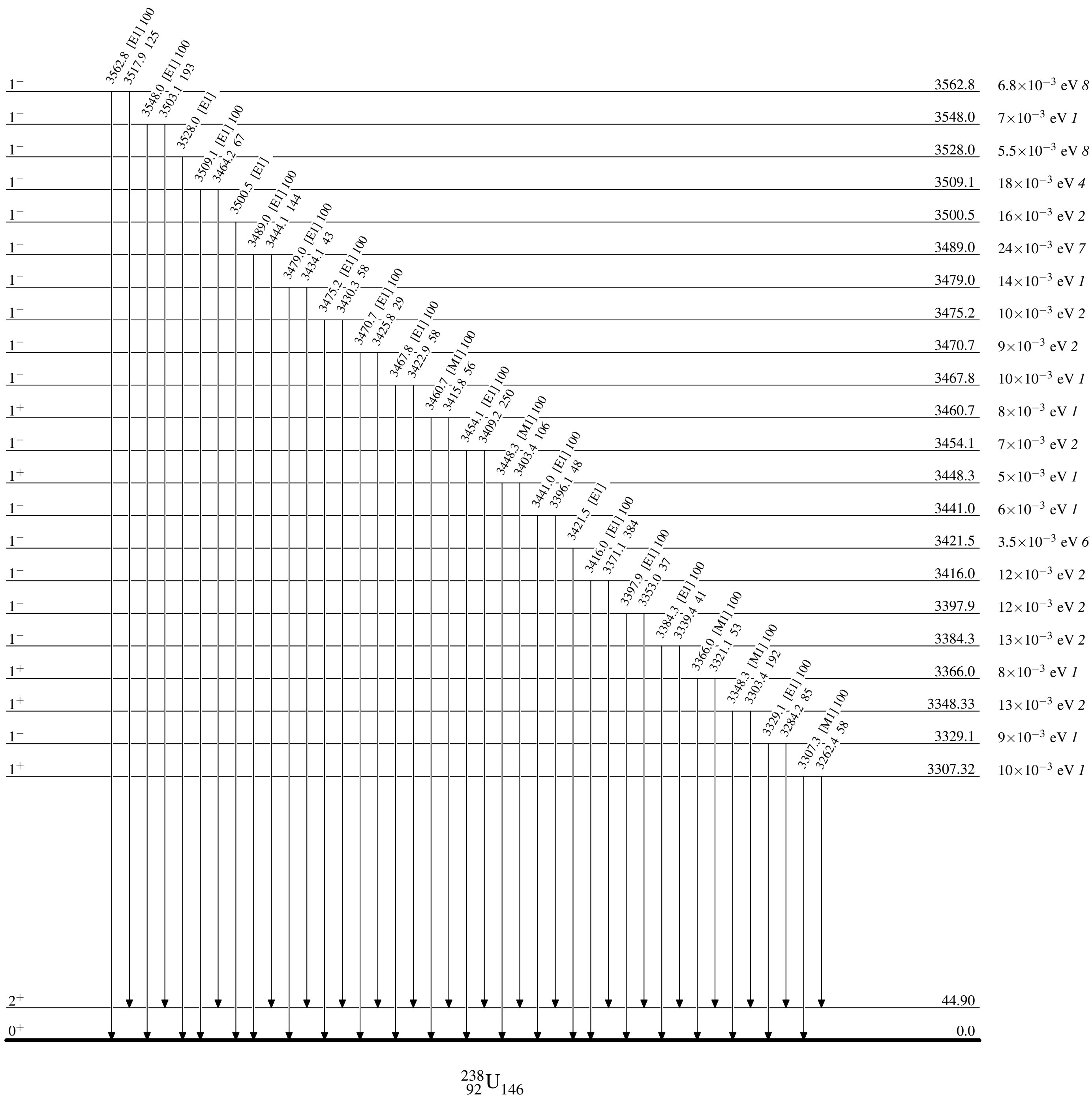


$^{238}_{92}U_{146}$

^{238}U(γ,γ') 2012Ha12

Level Scheme (continued)

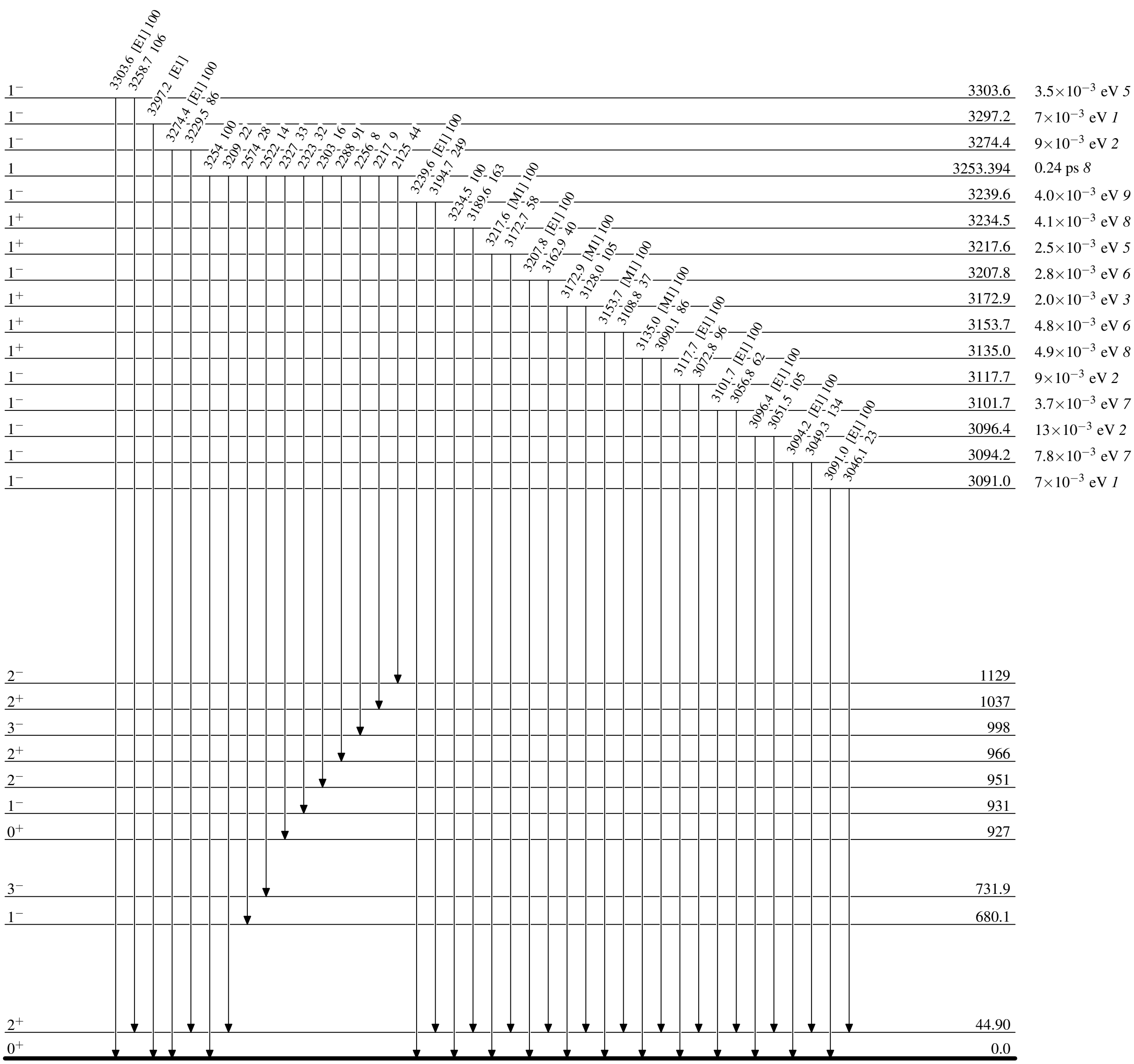
Intensities: Relative photon branching from each level



^{238}U(γ,γ′) 2012Ha12

Level Scheme (continued)

Intensities: Relative photon branching from each level

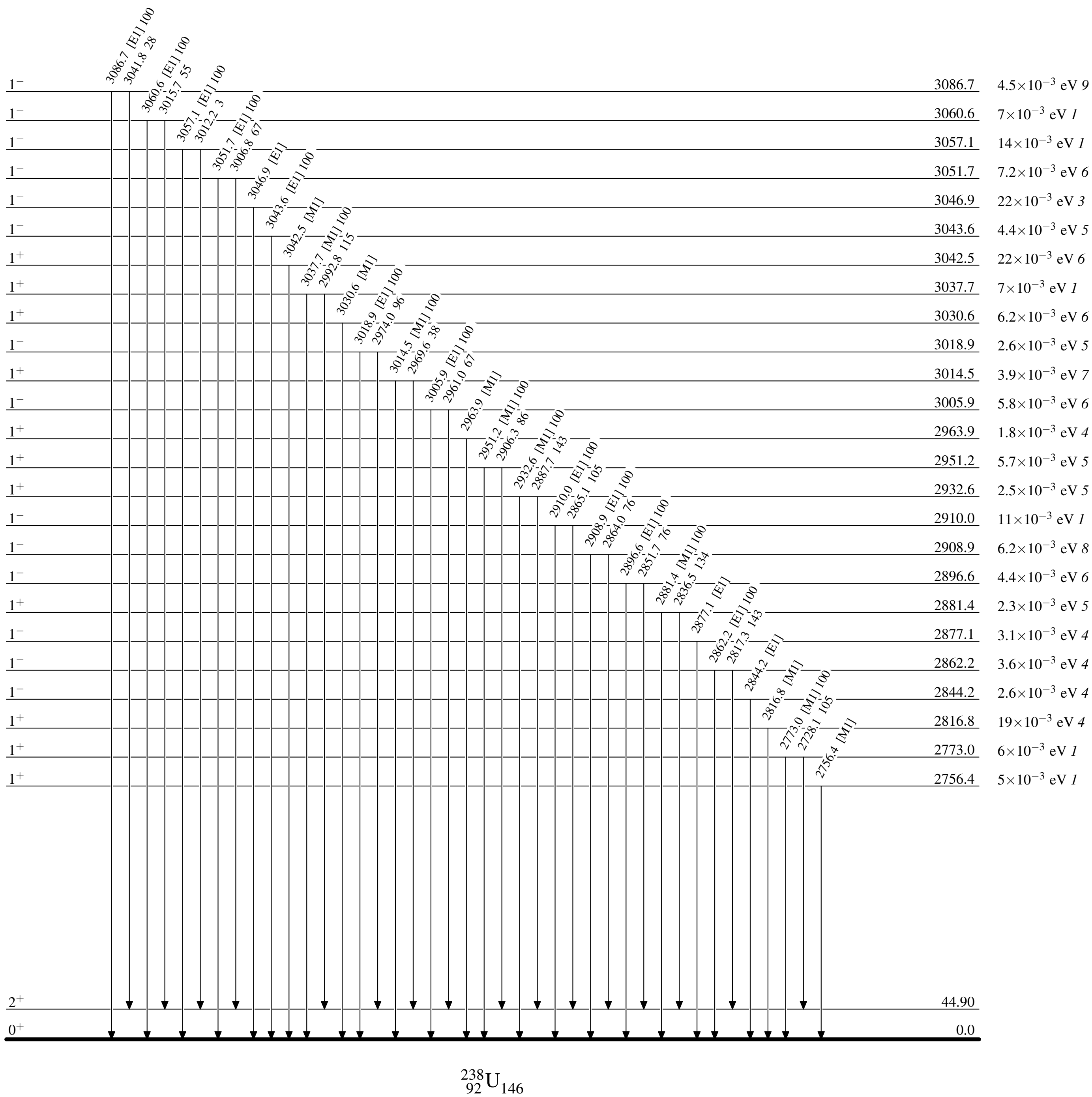


$^{238}_{92}U_{146}$

^{238}U(γ,γ′) 2012Ha12

Level Scheme (continued)

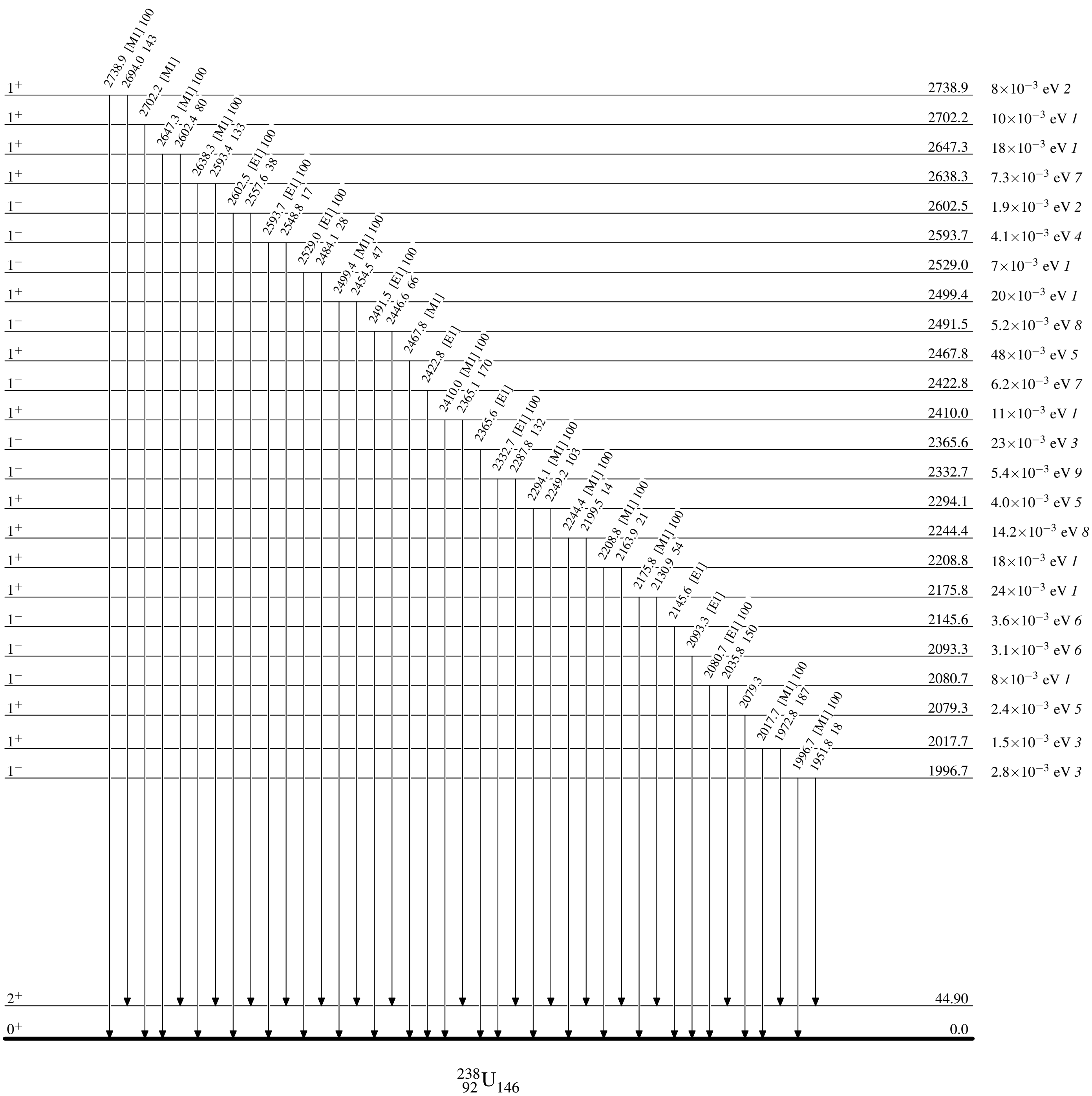
Intensities: Relative photon branching from each level



$^{238}U(\gamma,\gamma')$ **2012Ha12**

Level Scheme (continued)

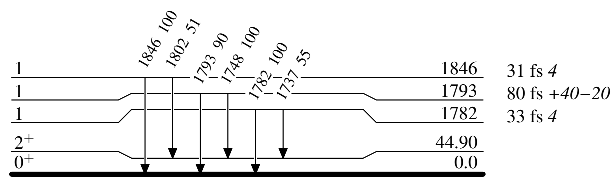
Intensities: Relative photon branching from each level



^{238}U(γ,γ′) 2012Ha12

Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{238}_{92}U_{146}$