Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	P. K. Joshi, B. Singh, S. Singh, A. K. Jain	NDS 138, 1 (2016)	15-Oct-2016

Q(β^-)=4213 *3*; S(n)=5885 *10*; S(p)=8018 *4*; Q(α)=663 *6* 2012Wa38
S(2n)=10298 *3*, S(2p)=18923 *9* (2012Wa38).
1999Am05, 1986Au02: mass measurements.
1992Pr04: measured Q(β^-) value for ^{139}Cs β^- decay.

^{139}Cs Levels

Cross Reference (XREF) Flags

- A ^{139}Xe β^- decay (39.68 s)
- B ^{248}Cm SF decay
- C ^{252}Cf SF decay

E(level)[†]	J$^\pi$	T$_{1/2}$[a]	XREF	Comments
0.0[b]	7/2$^+$	9.27 min *5*	ABC	%β^-=100 μ=+2.696 *4* (1979Bo01,2014StZZ) Q=−0.063 *14* (1979Bo01,2016St14) RMS charge radius <r^2>$^{1/2}$=4.8422 fm *69* (2013An02 evaluation). J$^\pi$: spin from AB (1979Bo01,1979Ek02), hyperfine laser spectroscopy (1981Th06,1987Co19); parity from agreement of experimental μ with shell-model calculations. T$_{1/2}$: from 1969Ca03 (627γ, 1285γ, 2-6 MeV β; scin). Others: 9.27 min *16* (1986Ok03, 627γ,1283γ; He-jet), 9.76 min *8* (1972Eh02, β, pc), 9.53 min *10* (1970OsZZ, 4$\pi\beta$, scin), 8.98 min *33* (1970RuZR, NaI), 9.00 min *15* (1966Ar08, Eβ>2.4 MeV, scint. for ^{138}Cs and ^{139}Cs, ≈18 half-lives). μ,Q: collinear fast beam laser spectroscopy (1979Bo01,1978Sc27). Value of −0.075 *11* in 1979Bo01 re-evaluated by 2013StZZ. Others: μ=+2.70 *1*, Q=−0.06 *3* (atomic beam laser spectroscopy, 1981Th06); μ=+2.70 *3* (atomic beam, 1979Ek02).
218.633 *24*	5/2$^+$,7/2$^+$	2.23 ns *5*	ABC	J$^\pi$: M1+E2 γ to 7/2$^+$; log *ft*<11 from 3/2$^-$ parent gives ≤7/2$^+$; low-lying 5/2$^+$ level in ^{141}Cs and 143Cs suggest (5/2$^+$).
289.75 *4*	3/2$^+$,5/2$^+$,7/2$^+$	96 ps *25*	A	J$^\pi$: E2,M1 γ to 7/2$^+$; log *ft*<11 from 3/2$^-$ parent gives ≤7/2$^+$.
393.59 *3*	3/2$^+$,5/2$^+$,7/2$^+$	24 ps *15*	A	J$^\pi$: E2,M1 γ to 7/2$^+$; log *ft*<11 from 3/2$^-$ parent gives ≤7/2$^+$.
393.65 *3*	(3/2$^+$,5/2$^+$,7/2$^+$)	1.71 ns *2*	A	J$^\pi$: (M1+E2) γ to 5/2$^+$,7/2$^+$; log *ft*<11 from 3/2$^-$ parent gives ≤7/2$^+$. See also footnote in Levels from ^{139}Xe β^- Decay.
515.11 *4*	3/2$^+$,5/2$^+$	6 ps *+10−6*	A	J$^\pi$: γ to 7/2$^+$. ≤5/2 from log $f^{1u}t$<8.5 for feeding from 3/2$^-$ parent. π=+ from E2,M1 γ to 5/2$^+$,7/2$^+$.
595.43[c] *13*	(9/2$^+$)		ABC	J$^\pi$: (M1+E2) γ to 7/2$^+$; yrast-type population in SF decays.
601.61[b] *25*	(11/2$^+$)		BC	J$^\pi$: ΔJ=2, Q γ to 7/2$^+$; band member.
646.51 *6*	3/2,5/2,7/2$^+$[‡]		A	
710.12 *5*			A	
732.36 *4*	3/2$^+$,5/2,7/2$^+$		A	J$^\pi$: γ to 7/2$^+$; log *ft*<11 from 3/2$^-$ parent gives ≤7/2$^+$.
891.53 *6*	3/2,5/2,7/2$^+$[‡]		A	
942.60 *4*	3/2,5/2,7/2$^+$[‡]		A	
1006.52 *4*	1/2$^{(+)}$,3/2,5/2[#]	15 ps *10*	A	
1020.28 *6*	3/2,5/2,7/2$^+$[‡]		A	
1037.22 *9*			A	
1070.7[c] *3*	(13/2$^+$)		BC	J$^\pi$: ΔJ=2, Q γ to (9/2$^+$); γ to (11/2$^+$); band member.
1138.84 *5*			A	

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Adopted Levels, Gammas (continued)

^{139}Cs Levels (continued)

E(level)[†]	Jπ	XREF	Comments
1146.0[b] *4*	(15/2+)	BC	Jπ: ΔJ=2, Q γ to (11/2+); band member.
1214.07 *10*		A	
1395.09 *9*		A	
1411.6 *3*		A	
1461.25 *7*		A	
1498.9[c] *4*	(17/2+)	BC	Jπ: ΔJ=2, Q γ to (13/2+); γ to (15/2+); band member.
1508.44 *7*		A	
1510.33 *24*		A	
1600.02 *7*		A	
1652.78 *5*		A	
1693.86 *11*		A	
1718.05 *4*		A	
1721.93 *24*		A	
1735.8[b] *4*	(19/2+)	BC	Jπ: ΔJ=2, Q γ to (15/2+); (M1+E2) γ to (17/2+); band member.
1738.61 *5*		A	
1793.18 *21*		A	
1816.4? *4*	3/2,5/2,7/2+[‡]	A	
1831.21 *25*		A	
1846.6[d] *4*		C	
2063.74 *9*	3/2,5/2,7/2+[‡]	A	
2099.59 *15*		A	
2103.8? *4*	3/2,5/2,7/2+[‡]	A	
2119.50? *15*		A	
2185.52 *5*	1/2(+),3/2,5/2[#]	A	
2239.3[c] *4*	(21/2+)	BC	Jπ: ΔJ=2, Q γ to (17/2+); γ to (19/2+); band member.
2304.67 *8*	3/2,5/2[@]	A	
2328.85 *6*	3/2,5/2[@]	A	
2372.86 *7*	1/2(+),3/2,5/2[#]	A	
2391.1[d] *5*		C	
2423.83 *23*	3/2,5/2,7/2+[‡]	A	
2432.46 *23*		A	
2492.4[b] *4*	(23/2+)	BC	Jπ: γs to (19/2+) and (21/2+); band member.
2510.45 *7*	3/2,5/2[@]	A	
2585.97 *9*	1/2(+),3/2,5/2[#]	A	
2620.38 *8*	1/2(+),3/2,5/2[#]	A	
2727.74 *17*		A	
2754.03? *17*	3/2,5/2[@]	A	
2781.6[d] *5*		C	
2797.37 *11*	1/2(+),3/2,5/2[#]	A	
2852.32? *17*	1/2(+),3/2,5/2[#]	A	
2937.01 *21*	3/2,5/2[@]	A	
2967.2[c] *5*	(25/2+)	BC	Jπ: ΔJ=2, Q γ to (21/2+); γ to (23/2+); band member.
2967.60 *10*	1/2(+),3/2,5/2[#]	A	
2980.2? *3*	1/2(+),3/2,5/2[#]	A	
3130.38? *18*	3/2(+),5/2	A	Jπ: γ to 7/2+; possible allowed or first-forbidden β feeding from 3/2− parent.
3146.7? *3*	3/2,5/2[@]	A	
3155.99? *23*	3/2,5/2[@]	A	
3189.8 *5*		C	
3208.70 *15*	1/2,3/2,5/2[#]	A	

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Adopted Levels, Gammas (continued)

^{139}Cs Levels (continued)

E(level)[†]	Jπ	XREF	Comments
3337.6[b] *5*	(27/2+)	C	Jπ: γ to (23/2+); band member.
3343.1[d] *5*		C	
3372.69? *19*	1/2,3/2,5/2[#]	A	
3375.39 *17*	3/2,5/2[@]	A	
3496.1[c] *6*	(29/2+)	C	Jπ: γ to (25/2+); band member.
3504.65? *17*	3/2,5/2[@]	A	
3745.55 *25*	1/2,3/2,5/2[#]	A	
3775.84? *12*	1/2,3/2,5/2[#]	A	
3815.27? *22*	1/2,3/2,5/2[#]	A	
3924.67? *21*	1/2,3/2,5/2[#]	A	
4145.1[b] *6*	(31/2+)	C	Jπ: γ to (27/2+); band member.
4227.9? *3*	1/2−,3/2−,5/2−[&]	A	
4323.7[c] *6*	(33/2+)	C	Jπ: γ to (29/2+); band member.
4669.7[c] *7*	(37/2+)	C	Jπ: γ to (33/2+); band member.

[†] From least-squares fit to Eγ values, assuming 0.3 keV uncertainty for Eγ when not stated. Uncertainties of 652.28γ from 942.6 level 996.4γ from 1214.07 level were doubled to obtain an acceptable fit. Reduced χ^2=1.7 as compared to critical χ^2=1.3.

[‡] 3/2 to 11/2 from γ to 7/2+. ≤7/2+ from log *ft*<11 for feeding from 3/2− parent.

[#] log $f^{1u}t$<8.5 for feeding from 3/2− parent, combined with γ to a level with possible J^π=5/2+ in a few cases, which favors 1/2+ over 1/2−.

[@] 3/2 to 11/2 from γ to 7/2+. ≤5/2 from log $f^{1u}t$<8.5 for feeding from 3/2− parent.

[&] log *ft*<5.9 for feeding from 3/2− parent.

[a] For excited states values are from 2011Ro42, measured by βγ(t) and γγ(t), fast timing technique using BaF_2 and $LaBr_3$ detectors with gating on the HPGe detector. The time spectra were analyzed by shape deconvolution method, and half-life obtained as a slope on the delayed part of the time spectrum and/or by the centroid-shift method, the latter, especially for shorter half-lives up to about 10 ps or so. 2012Ro47 conference report is from the same authors.

[b] Band(A): The g.s. band.

[c] Band(B): Band based on (9/2+). This band has the same parity as the g.s. band, as the 236.9-keV linking transition is (M1+E2) from total conversion coefficient deduced by 2009Li42 from transition intensity balance.

[d] Band(C): γ cascade.

Adopted Levels, Gammas (continued)

γ(^{139}Cs)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[†]	δ	α[&]	Comments
218.633	5/2$^+$,7/2$^+$	218.59 *3*	100	0.0	7/2$^+$	E2,M1		0.119 *5*	α(K)=0.0957 *24*; α(L)=0.0184 *19*; α(M)=0.0039 *5*; α(N)=0.00080 *9*; α(O)=0.000102 *9* α(P)=3.22×10^{-6} *8*
289.75	3/2$^+$,5/2$^+$,7/2$^+$	71.0 *4*	2.20 *6*	218.633	5/2$^+$,7/2$^+$	[M1,E2]		4.4 *20*	α(K)=2.7 *7*; α(L)=1.4 *11*; α(M)=0.30 *24*; α(N)=0.06 *5*; α(O)=0.007 *6*; α(P)=8.4×10^{-5} *3*
		289.78 *7*	100 *5*	0.0	7/2$^+$	E2,M1		0.0486	α(K)=0.0397 *6*; α(L)=0.00710 *10*; α(M)=0.001484 *21*; α(N)=0.000308 *5*; α(O)=3.98×10^{-5} *6* α(P)=1.341×10^{-6} *19*
393.59	3/2$^+$,5/2$^+$,7/2$^+$	103.75 *6*	2.77 *20*	289.75	3/2$^+$,5/2$^+$,7/2$^+$	M1(+E2)	<0.87	1.02 *21*	B(M1)(W.u.)=0.012 *+18−8*; B(E2)(W.u.)<2.0 α(K)=0.79 *10*; α(L)=0.18 *9*; α(M)=0.038 *19*; α(N)=0.008 *4*; α(O)=0.0010 *5*; α(P)=2.80×10^{-5} *8*
		174.97[b] *4*	100[b] *7*	218.633	5/2$^+$,7/2$^+$	(M1+E2)		0.23 *4*	
		393.50 *6*	59 *3*	0.0	7/2$^+$	E2,M1		0.0199 *12*	α(K)=0.0168 *12*; α(L)=0.00247 *4*; α(M)=0.000510 *9*; α(N)=0.0001068 *16*; α(O)=1.44×10^{-5} *3* α(P)=6.1×10^{-7} *7*
393.65	(3/2$^+$,5/2$^+$,7/2$^+$)	174.97[b] *4*	100[b]	218.633	5/2$^+$,7/2$^+$	(M1+E2)		0.23 *4*	
515.11	3/2$^+$,5/2$^+$	121.37[b] *8*	2.16[b] *8*	393.65	(3/2$^+$,5/2$^+$,7/2$^+$)				
		121.37[b] *8*	0.28[b] *3*	393.59	3/2$^+$,5/2$^+$,7/2$^+$				
		225.38 *7*	13.89 *13*	289.75	3/2$^+$,5/2$^+$,7/2$^+$	[M1,E2]		0.103 *9*	α(K)=0.085 *4*; α(L)=0.014 *4*; α(M)=0.0030 *8*; α(N)=0.00062 *17*; α(O)=8.2×10^{-5} *18* α(P)=3.03×10^{-6} *17*
		296.53 *7*	100.0 *21*	218.633	5/2$^+$,7/2$^+$	E2,M1		0.0455 *8*	α(K)=0.0382 *14*; α(L)=0.0058 *8*; α(M)=0.00121 *17*; α(N)=0.00025 *4*; α(O)=3.4×10^{-5} *3* α(P)=1.39×10^{-6} *15*
		515.44 *14*	1.70 *5*	0.0	7/2$^+$				
595.43	(9/2$^+$)	595.43 *13*	100	0.0	7/2$^+$	(M1+E2)	−4.2 *+4−5*		δ: −4.2 *+4−5* or −0.07 *2* from γγ(θ) (2009Li42), shell-model predicted value of −3.6 favors higher value. From RUL, large δ(Q/D) is consistent with M1+E2 rather than E1+M2, assuming level half-life is less than 10 ns.
601.61	(11/2$^+$)	601.6		0.0	7/2$^+$	Q			

$^{139}_{55}Cs_{84}$-4

Adopted Levels, Gammas (continued)

γ(^{139}Cs) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[†]	α[&]	Comments
646.51	3/2,5/2,7/2$^+$	356.72 *8*	84.7 *9*	289.75	3/2$^+$,5/2$^+$,7/2$^+$	‡	0.105‡ *33*	Mult.: α(K)exp=0.079 *25* is too large for M1 and E2, barely overlaps M2 or E3. α: deduced from α(K)exp.
		646.50 *7*	100.0 *18*	0.0	7/2$^+$			
710.12		491.47[b] *4*	100[b]	218.633	5/2$^+$,7/2$^+$			
732.36	3/2$^+$,5/2,7/2$^+$	338.86 *7*	32.6 *6*	393.59	3/2$^+$,5/2$^+$,7/2$^+$	D,E2		
		442.7 *4*	9.4 *3*	289.75	3/2$^+$,5/2$^+$,7/2$^+$	[D,E2]		
		513.88 *11*	44 *5*	218.633	5/2$^+$,7/2$^+$	[D,E2]		
		732.42 *6*	100.0 *12*	0.0	7/2$^+$	D,E2		
891.53	3/2,5/2,7/2,7/2$^+$	181.3 *1*	11.9 *5*	710.12				
		498.2 *5*	3.8 *5*	393.59	3/2$^+$,5/2$^+$,7/2$^+$	[D,E2]		
		601.84 *7*	100 *52*	289.75	3/2$^+$,5/2$^+$,7/2$^+$			
		672.39 *18*	12.4 *5*	218.633	5/2$^+$,7/2$^+$			
		891.76 *18*	14.8 *10*	0.0	7/2$^+$			
942.60	3/2,5/2,7/2,7/2$^+$	427.7 *4*	4.0 *3*	515.11	3/2$^+$,5/2$^+$	[D,E2]		
		549.02[b] *4*	3.4[b] *3*	393.65	(3/2$^+$,5/2$^+$,7/2$^+$)			
		549.02[b] *4*	38.2[b] *10*	393.59	3/2$^+$,5/2$^+$,7/2$^+$			
		652.28 *13*	14.9 *3*	289.75	3/2$^+$,5/2$^+$,7/2$^+$			E_γ: poor fit. Level-energy difference=652.85.
		723.84 *6*	100.0 *13*	218.633	5/2$^+$,7/2$^+$			
		942.61 *22*	4.4 *25*	0.0	7/2$^+$			
1006.52	1/2$^{(+)}$,3/2,5/2	491.47[b] *4*	32[b] *4*	515.11	3/2$^+$,5/2$^+$			
		612.82[b] *4*	100[b] *10*	393.65	(3/2$^+$,5/2$^+$,7/2$^+$)			
		612.82[b] *4*	27.2[b] *25*	393.59	3/2$^+$,5/2$^+$,7/2$^+$			
		716.96 *22*	3.58 *12*	289.75	3/2$^+$,5/2$^+$,7/2$^+$			
		788.04 *8*	77.8 *13*	218.633	5/2$^+$,7/2$^+$			
1020.28	3/2,5/2,7/2,7/2$^+$	505.07 *8*	37.6 *6*	515.11	3/2$^+$,5/2$^+$			
		626.89 *11*	100 *18*	393.59	3/2$^+$,5/2$^+$,7/2$^+$			
		730.4 *3*	15.9 *6*	289.75	3/2$^+$,5/2$^+$,7/2$^+$			
		801.62 *9*	62.4 *12*	218.633	5/2$^+$,7/2$^+$			
1037.22		305.0 *1*	14.3 *21*	732.36	3/2$^+$,5/2,7/2$^+$			
		326.8 *4*	32.6 *21*	710.12				
		818.29 *15*	100.0 *21*	218.633	5/2$^+$,7/2$^+$			
1070.7	(13/2$^+$)	469.1		601.61	(11/2$^+$)			
		475.3		595.43	(9/2$^+$)	Q		
1138.84		624.3 *7*	20.2 *12*	515.11	3/2$^+$,5/2$^+$			
		745.16[b] *7*	100[b] *11*	393.65	(3/2$^+$,5/2$^+$,7/2$^+$)			
		745.16[b] *7*	11.9[b] *12*	393.59	3/2$^+$,5/2$^+$,7/2$^+$			
1146.0	(15/2$^+$)	544.4		601.61	(11/2$^+$)	Q		
1214.07		699.6 *3*	28.3 *19*	515.11	3/2$^+$,5/2$^+$			
		996.4 *2*	100 *4*	218.633	5/2$^+$,7/2$^+$			E_γ: poor fit. Level-energy difference=995.4.
		1214.9[c] *4*	24 *8*	0.0	7/2$^+$			

Adopted Levels, Gammas (continued)

γ(^{139}Cs) (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	Mult.†	α&	Comments
1395.09		388.6 *1*	39 *4*	1006.52	$1/2^{(+)}$,3/2,5/2			
		879.74 *18*	100 *7*	515.11	$3/2^+$,$5/2^+$			
		1001.7 *4*	39 *4*	393.59	$3/2^+$,$5/2^+$,$7/2^+$			
		1105.6 *3*	64 *4*	289.75	$3/2^+$,$5/2^+$,$7/2^+$			
		1176.3 *6*	50 *4*	218.633	$5/2^+$,$7/2^+$			
1411.6		896.3 *3*	100	515.11	$3/2^+$,$5/2^+$			
1461.25		441.3 *7*	37.0 *22*	1020.28	3/2,5/2,$7/2^+$			
		454.46 *13*	100.0 *22*	1006.52	$1/2^{(+)}$,3/2,5/2			
		518.8 *1*	19.6 *22*	942.60	3/2,5/2,$7/2^+$			
		569.64 *22*	59 *24*	891.53	3/2,5/2,$7/2^+$			
		946.5 *3*	24 *13*	515.11	$3/2^+$,$5/2^+$			
		1067.56[b] *24*	6.5[b] *22*	393.65	($3/2^+$,$5/2^+$,$7/2^+$)			
		1067.56[b] *24*	57[b] *5*	393.59	$3/2^+$,$5/2^+$,$7/2^+$			
		1171.5 *4*	56.5 *22*	289.75	$3/2^+$,$5/2^+$,$7/2^+$			
1498.9	($17/2^+$)	352.9		1146.0	($15/2^+$)			
		428.2		1070.7	($13/2^+$)	Q		
1508.44		565.4 *3*	18 *6*	942.60	3/2,5/2,$7/2^+$			
		775.6 *4*	17.1 *12*	732.36	$3/2^+$,5/2,$7/2^+$			
		1114.8 *1*	27.3 *23*	393.59	$3/2^+$,$5/2^+$,$7/2^+$			
		1115.0[a] *1*	35[a] *6*	393.65	($3/2^+$,$5/2^+$,$7/2^+$)			
		1289.47 *19*	100.0 *23*	218.633	$5/2^+$,$7/2^+$			
1510.33		914.9 *2*		595.43	($9/2^+$)			
1600.02		1206.45[b] *10*	54[b] *4*	393.65	($3/2^+$,$5/2^+$,$7/2^+$)			
		1206.45[b] *10*	100[b] *5*	393.59	$3/2^+$,$5/2^+$,$7/2^+$			
		1309.4[c] *8*	25 *16*	289.75	$3/2^+$,$5/2^+$,$7/2^+$			
1652.78		710.40 *18*	35.7 *11*	942.60	3/2,5/2,$7/2^+$			
		761.04 *16*	35.7 *11*	891.53	3/2,5/2,$7/2^+$			
		1006.25 *14*	46.9 *11*	646.51	3/2,5/2,$7/2^+$			
		1137.52 *10*	65 *9*	515.11	$3/2^+$,$5/2^+$			
		1259.26 *9*	100 *3*	393.59	$3/2^+$,$5/2^+$,$7/2^+$			
		1362.91 *12*	57.1 *21*	289.75	$3/2^+$,$5/2^+$,$7/2^+$			
		1434.13 *24*	45 *3*	218.633	$5/2^+$,$7/2^+$			
		1652.8[c] *3*	20 *5*	0.0	$7/2^+$			
1693.86		960.6 *5*	17 *4*	732.36	$3/2^+$,5/2,$7/2^+$			
		1178.73[b] *12*	100[b] *17*	515.11	$3/2^+$,$5/2^+$			
		1299.8 *9*	15.0 *17*	393.65	($3/2^+$,$5/2^+$,$7/2^+$)			
		1404.16 *25*	38.3 *17*	289.75	$3/2^+$,$5/2^+$,$7/2^+$			
1718.05		579.4 *1*	18.5 *19*	1138.84				
		986.02 *11*	100 *4*	732.36	$3/2^+$,5/2,$7/2^+$			
		1324.38 *2*	69 *8*	393.65	($3/2^+$,$5/2^+$,$7/2^+$)			
1721.93		1126.5 *2*		595.43	($9/2^+$)			
1735.8	($19/2^+$)	236.9		1498.9	($17/2^+$)	(M1+E2)	0.086 *12*	Mult.: from total conversion coefficient deduced from

Adopted Levels, Gammas (continued)

γ(^{139}Cs) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[†]	Comments
							intensity balance considerations in γγ-coincidence analysis in ^{252}Cf SF decay.
1735.8	(19/2$^+$)	589.8		1146.0	(15/2$^+$)	Q	
1738.61		1344.93[b] *7*	100[b] *6*	393.65	(3/2$^+$,5/2$^+$,7/2$^+$)		
		1344.93[b] *7*	10[b] *6*	393.59	3/2$^+$,5/2$^+$,7/2$^+$		
		1449.0 *4*	13.9 *6*	289.75	3/2$^+$,5/2$^+$,7/2$^+$		
		1520.17 *8*	71 *3*	218.633	5/2$^+$,7/2$^+$		
1793.18		786.7 *6*	36 *9*	1006.52	1/2$^{(+)}$,3/2,5/2		
		1793.0 *5*	100 *18*	0.0	7/2$^+$		
1816.4?	3/2,5/2,7/2$^+$	1817.6[c] *9*	100	0.0	7/2$^+$		
1831.21		888.6 *5*	44 *4*	942.60	3/2,5/2,7/2$^+$		
		1316.4 *4*	100 *8*	515.11	3/2$^+$,5/2$^+$		
		1437.7 *7*	74 *26*	393.65	(3/2$^+$,5/2$^+$,7/2$^+$)		
		1612.4[c] *4*	96 *19*	218.633	5/2$^+$,7/2$^+$		
1846.6		700.6		1146.0	(15/2$^+$)		
2063.74	3/2,5/2,7/2$^+$	924.5 *6*	41 *3*	1138.84			
		1416.5 *4*	44.3 *15*	646.51	3/2,5/2,7/2$^+$		
		1773.84 *13*	77.1 *15*	289.75	3/2$^+$,5/2$^+$,7/2$^+$		
		2063.90 *12*	100 *3*	0.0	7/2$^+$		
2099.59		1367.19 *16*	100 *4*	732.36	3/2$^+$,5/2,7/2$^+$		
		1584.7 *4*	73 *24*	515.11	3/2$^+$,5/2$^+$		
2103.8?	3/2,5/2,7/2$^+$	2103.7[c] *6*	100	0.0	7/2$^+$		
2119.50?		55.7[c] *3*	86 *23*	2063.74	3/2,5/2,7/2$^+$	D(+Q)[#]	
		980.59[c] *18*	100 *5*	1138.84			
		1099.4[c] *5*	50 *5*	1020.28	3/2,5/2,7/2$^+$		
2185.52	1/2$^{(+)}$,3/2,5/2	446.8 *3*	9.1 *5*	1738.61			
		585.6 *1*	4.1 *5*	1600.02			
		773.4 *5*	10.2 *5*	1411.6			
		970.3 *4*	7.6 *5*	1214.07			
		1046.31 *15*	26.9 *10*	1138.84			
		1178.73[b] *12*	2.5[b] *16*	1006.52	1/2$^{(+)}$,3/2,5/2		
		1242.88 *8*	58.9 *11*	942.60	3/2,5/2,7/2$^+$		
		1453.32 *10*	44.2 *11*	732.36	3/2$^+$,5/2,7/2$^+$		
		1670.33 *8*	100.0 *16*	515.11	3/2$^+$,5/2$^+$		
		1895.98 *9*	54.3 *11*	289.75	3/2$^+$,5/2$^+$,7/2$^+$		
		1967.3 *3*	11.2 *5*	218.633	5/2$^+$,7/2$^+$		
2239.3	(21/2$^+$)	503.5		1735.8	(19/2$^+$)		
		740.4		1498.9	(17/2$^+$)	Q	
2304.67	3/2,5/2	119.4[c] *4*	11 *4*	2185.52	1/2$^{(+)}$,3/2,5/2		
		1297.85 *19*	70.5 *9*	1006.52	1/2$^{(+)}$,3/2,5/2		
		2015.11 *17*	27.7 *9*	289.75	3/2$^+$,5/2$^+$,7/2$^+$		
		2085.91 *10*	100.0 *18*	218.633	5/2$^+$,7/2$^+$		

Adopted Levels, Gammas (continued)

γ(^{139}Cs) (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π
2304.67	3/2,5/2	2304.97 *16*	46 *5*	0.0	$7/2^+$
2328.85	3/2,5/2	589.8 *4*	13.3 *9*	1738.61	
		675.79 *16*	25.7 *9*	1652.78	
		820.5[c] *4*	12.4 *9*	1508.44	
		1115.0[a] *1*	27[a] *4*	1214.07	
		1291.4 *4*	27 *5*	1037.22	
		1309.4 *8*	52.2 *18*	1020.28	$3/2,5/2,7/2^+$
		1386.19 *11*	81 *4*	942.60	$3/2,5/2,7/2^+$
		1814.1 *4*	19 *3*	515.11	$3/2^+,5/2^+$
		1935.1[ac] *5*	18[a] *3*	393.65	$(3/2^+,5/2^+,7/2^+)$
		1935.1[ac] *5*	18[a] *3*	393.59	$3/2^+,5/2^+,7/2^+$
		2039.1 *4*	12.4 *9*	289.75	$3/2^+,5/2^+,7/2^+$
		2110.12 *13*	54 *8*	218.633	$5/2^+,7/2^+$
		2328.80 *9*	100 *6*	0.0	$7/2^+$
2372.86	$1/2^{(+)},3/2,5/2$	634.2 *1*	6.4 *11*	1738.61	
		719.8[c] *6*	13 *6*	1652.78	
		1233.8 *1*	7.5 *11*	1138.84	
		1857.6 *4*	21.5 *11*	515.11	$3/2^+,5/2^+$
		1979.57 *11*	100.0 *22*	393.59	$3/2^+,5/2^+,7/2^+$
2391.1		544.5		1846.6	
		655.3[c]		1735.8	$(19/2^+)$
2423.83	$3/2,5/2,7/2^+$	1416.94[c] *20*	100 *15*	1006.52	$1/2^{(+)},3/2,5/2$
		2204.6 *6*	29 *15*	218.633	$5/2^+,7/2^+$
		2423.6 *4*	29 *7*	0.0	$7/2^+$
2432.46		832.41 *24*	46 *4*	1600.02	
		1540.1[c] *7*	39 *4*	891.53	$3/2,5/2,7/2^+$
		1700.2 *5*	100 *33*	732.36	$3/2^+,5/2,7/2^+$
		1786.6[c] *4*	39 *15*	646.51	$3/2,5/2,7/2^+$
2492.4	$(23/2^+)$	253.1		2239.3	$(21/2^+)$
		756.6		1735.8	$(19/2^+)$
2510.45	3/2,5/2	772.0 *1*	13.9 *14*	1738.61	
		1490.0 *4*	51 *7*	1020.28	$3/2,5/2,7/2^+$
		1503.1 *6*	50.0 *14*	1006.52	$1/2^{(+)},3/2,5/2$
		1862.4 *7*	74 *5*	646.51	$3/2,5/2,7/2^+$
		1994.2 *4*	21 *3*	515.11	$3/2^+,5/2^+$
		2116.88 *11*	79 *3*	393.59	$3/2^+,5/2^+,7/2^+$
		2291.61 *21*	100 *7*	218.633	$5/2^+,7/2^+$
		2510.41 *18*	68 *7*	0.0	$7/2^+$
2585.97	$1/2^{(+)},3/2,5/2$	847.45 *12*	76.7 *17*	1738.61	
		1190.6 *6*	25 *10*	1395.09	
		1579.5[c] *4*	58 *10*	1006.52	$1/2^{(+)},3/2,5/2$
		1939.5[c] *3*	28 *5*	646.51	$3/2,5/2,7/2^+$

$^{139}_{55}Cs_{84}$-8

Adopted Levels, Gammas (continued)

γ(^{139}Cs) (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	Mult.†
2585.97	1/2(+),3/2,5/2	2192.32 *13*	100 *9*	393.65	(3/2+,5/2+,7/2+)	
		2366.97 *22*	40 *5*	218.633	5/2+,7/2+	
2620.38	1/2(+),3/2,5/2	926.8 *8*	9.1 *16*	1693.86		
		967.3[c] *5*	18.2 *15*	1652.78		
		1022.0[c] *6*	10.6 *16*	1600.02		
		1481.5 *1*	18 *3*	1138.84		
		1613.8 *1*	71 *5*	1006.52	1/2(+),3/2,5/2	
		2227.28 *25*	100 *23*	393.59	3/2+,5/2+,7/2+	
2727.74		1219.33 *21*	100 *18*	1508.44		
		2437.8 *3*	50 *9*	289.75	3/2+,5/2+,7/2+	
2754.03?	3/2,5/2	937.9[c] *4*	43 *4*	1816.4?	3/2,5/2,7/2+	
		1615.0[c] *3*	100 *18*	1138.84		
		1862.4[c] *7*	46 *4*	891.53	3/2,5/2,7/2+	
		2021.8[c] *4*	64 *4*	732.36	3/2+,5/2,7/2+	
		2238.4[c] *6*	93 *15*	515.11	3/2+,5/2+	
		2464.6[c] *5*	71 *11*	289.75	3/2+,5/2+,7/2+	
		2535.0[c] *5*	39 *11*	218.633	5/2+,7/2+	
		2754.2[c] *4*	43 *11*	0.0	7/2+	
2781.6		390.5		2391.1		
		542.3		2239.3	(21/2+)	
2797.37	1/2(+),3/2,5/2	1776.9 *4*	43 *3*	1020.28	3/2,5/2,7/2+	
		1790.85 *18*	100 *3*	1006.52	1/2(+),3/2,5/2	
		1854.5[c] *5*	30 *8*	942.60	3/2,5/2,7/2+	
		2403.75 *13*	61 *6*	393.59	3/2+,5/2+,7/2+	
		2507.6 *6*	18 *6*	289.75	3/2+,5/2+,7/2+	
		2578.9 *5*	14 *4*	218.633	5/2+,7/2+	
2852.32?	1/2(+),3/2,5/2	1199.43[c] *23*	100 *25*	1652.78		
		2633.75[c] *22*	59 *10*	218.633	5/2+,7/2+	
2937.01	3/2,5/2	1428.70 *21*	100 *3*	1508.44		
		2936.2 *5*	30 *9*	0.0	7/2+	
2967.2	(25/2+)	474.8		2492.4	(23/2+)	
		727.9		2239.3	(21/2+)	Q
2967.60	1/2(+),3/2,5/2	1228.8 *5*	23.0 *17*	1738.61		
		1458.98 *22*	72 *27*	1508.44		
		1830.2[@] *6*	23.0 *17*	1138.84		
		2025.1 *5*	16 *3*	942.60	3/2,5/2,7/2+	
		2451.6 *6*	13 *5*	515.11	3/2+,5/2+	
		2574.04 *12*	100 *9*	393.59	3/2+,5/2+,7/2+	
2980.2?	1/2(+),3/2,5/2	1149.2[c] *3*	100 *12*	1831.21		
		1765.2[c] *6*	36 *4*	1214.07		
		2761.6[c] *4*	48 *12*	218.633	5/2+,7/2+	

$^{139}_{55}Cs_{84}$-9

Adopted Levels, Gammas (continued)

γ(^{139}Cs) (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π
3130.38?	3/2(+),5/2	2736.7[ac] *3*	100[a] *19*	393.65	(3/2+,5/2+,7/2+)
		2736.7[ac] *3*	100[a] *19*	393.59	3/2+,5/2+,7/2+
		2911.7[c] *4*	57 *15*	218.633	5/2+,7/2+
		3130.6[c] *6*	67 *24*	0.0	7/2+
3146.7?	3/2,5/2	2255.3[c] *7*	100 *19*	891.53	3/2,5/2,7/2+
		3146.6[c] *3*	68 *13*	0.0	7/2+
3155.99?	3/2,5/2	783.1[c] *5*	50 *19*	2372.86	1/2(+),3/2,5/2
		1036.3[c] *3*	100 *9*	2119.50?	
		3156.3[c] *4*	36 *9*	0.0	7/2+
3189.8		950.5		2239.3	(21/2+)
3208.70	1/2,3/2,5/2	1608.7 *6*	42.5 *25*	1600.02	
		2693.4 *5*	35 *10*	515.11	3/2+,5/2+
		2815.03 *15*	100 *10*	393.65	(3/2+,5/2+,7/2+)
3337.6	(27/2+)	370.4[c]		2967.2	(25/2+)
		845.2		2492.4	(23/2+)
3343.1		375.9		2967.2	(25/2+)
		561.5		2781.6	
3372.69?	1/2,3/2,5/2	1273.1[c] *5*	38 *5*	2099.59	
		1911.42[c] *21*	100 *5*	1461.25	
		2430.3[c] *6*	33 *10*	942.60	3/2,5/2,7/2+
		2640.1[c] *6*	29 *15*	732.36	3/2+,5/2,7/2+
3375.39	3/2,5/2	1543.6[c] *6*	15 *3*	1831.21	
		1681.1 *3*	100 *44*	1693.86	
		1722.6[c] *6*	56 *6*	1652.78	
		3375.51 *19*	79 *9*	0.0	7/2+
3496.1	(29/2+)	528.9		2967.2	(25/2+)
3504.65?	3/2,5/2	1711.44[c] *17*	100 *20*	1793.18	
		1851.8[c] *5*	34 *2*	1652.78	
		2613.7[c] *7*	12 *6*	891.53	3/2,5/2,7/2+
		2989.4[c] *4*	26 *6*	515.11	3/2+,5/2+
		3110.8[ac] *7*	14[a] *8*	393.65	(3/2+,5/2+,7/2+)
		3110.8[ac] *7*	14[a] *8*	393.59	3/2+,5/2+,7/2+
		3214.8[c] *5*	14 *4*	289.75	3/2+,5/2+,7/2+
		3504.7[c] *3*	24 *4*	0.0	7/2+
3745.55	1/2,3/2,5/2	1017.7 *3*	57 *8*	2727.74	
		1641.7 *3*	100 *8*	2103.8?	3/2,5/2,7/2+
		2006.8[c] *4*	71 *8*	1738.61	
		2854.2 *4*	57 *11*	891.53	3/2,5/2,7/2+
3775.84?	1/2,3/2,5/2	1351.6[c] *4*	32.1 *19*	2423.83	3/2,5/2,7/2+
		2769.32[c] *12*	100 *8*	1006.52	1/2(+),3/2,5/2
3815.27?	1/2,3/2,5/2	2872.65[c] *25*	100 *14*	942.60	3/2,5/2,7/2+

$^{139}_{55}Cs_{84}$-10

Adopted Levels, Gammas (continued)

γ(^{139}Cs) (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π
3815.27?	1/2,3/2,5/2	3168.7[c] *4*	50 *9*	646.51	3/2,5/2,7/2$^+$	4227.9?	1/2$^-$,3/2$^-$,5/2$^-$	1803.99[c] *25*	100 *10*	2423.83	3/2,5/2,7/2$^+$
3924.67?	1/2,3/2,5/2	957.3[c] *4*	55 *5*	2967.60	1/2$^{(+)}$,3/2,5/2			2832.8[c] *4*	55 *10*	1395.09	
		2903.8[c] *4*	64 *14*	1020.28	3/2,5/2,7/2$^+$	4323.7	(33/2$^+$)	827.6		3496.1	(29/2$^+$)
		2918.3[c] *3*	100 *18*	1006.52	1/2$^{(+)}$,3/2,5/2	4669.7	(37/2$^+$)	346.0		4323.7	(33/2$^+$)
4145.1	(31/2$^+$)	807.5		3337.6	(27/2$^+$)						

† From ^{139}Xe β^- decay for gamma rays from low-spin (J≤9/2) states, and the levels populated only in this decay. For gamma rays from high-spin (J>9/2) states, values are from ^{252}Cf SF decay. Mult=Q indicates ΔJ=2, quadrupole (most likely E2) transition.

‡ M2,E3; E1+M2, δ>0.87; or E2+M3, 0.37<δ<0.63. α estimated from α(K)exp in β^- decay and possible mult′s and δ′s.

M1(+E2), δ≤0.5 *3* or E1(+M2), δ≤0.28 *6* from I(γ+ce) and Iγ.

@ Other member of doublet unplaced in β^- decay.

& Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

[a] Multiply placed with undivided intensity.

[b] Multiply placed with intensity suitably divided.

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

$^{139}_{55}Cs_{84}$-11

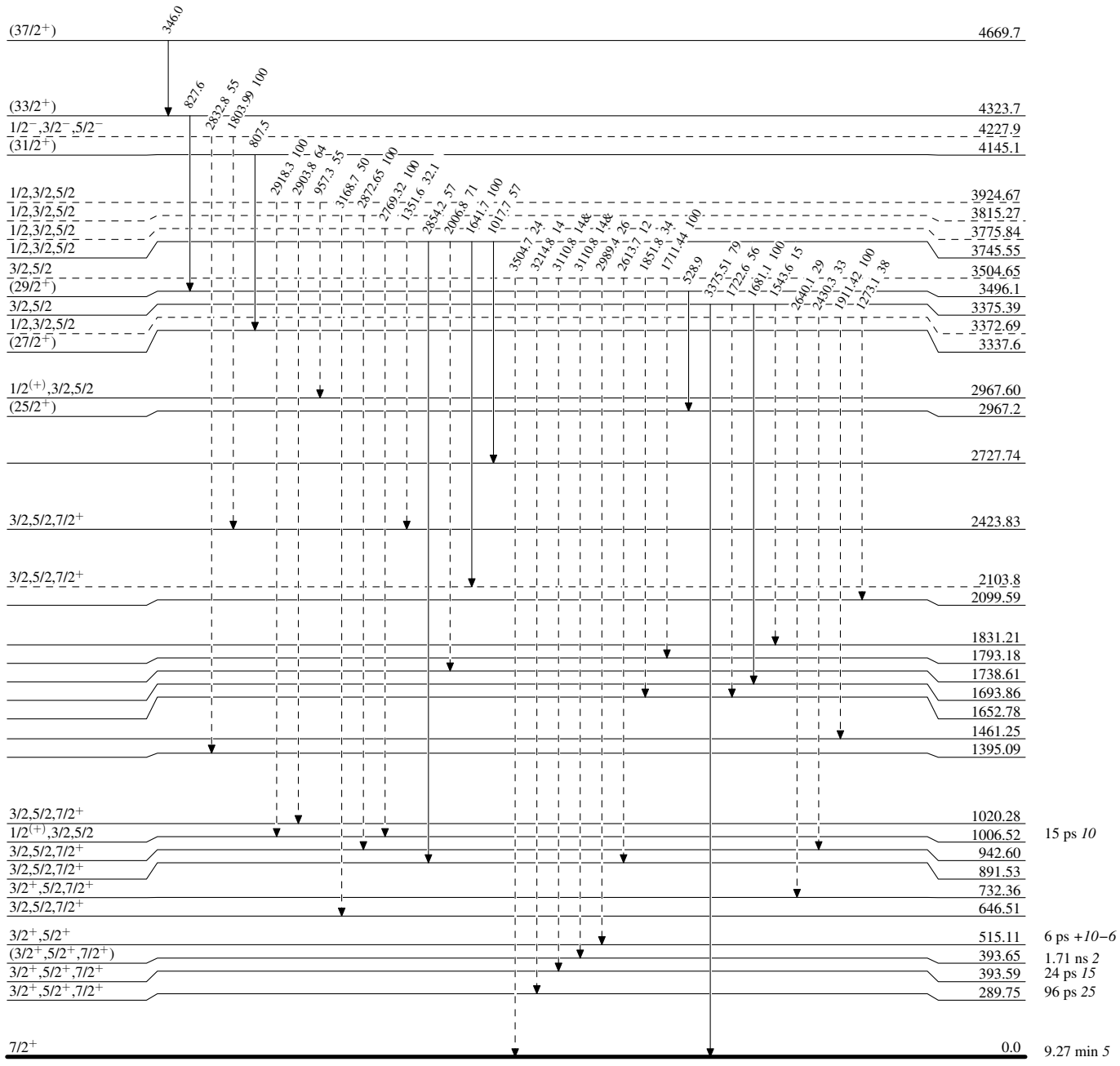
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

- - - - - - ► γ Decay (Uncertain)



$^{139}_{55}Cs_{84}$

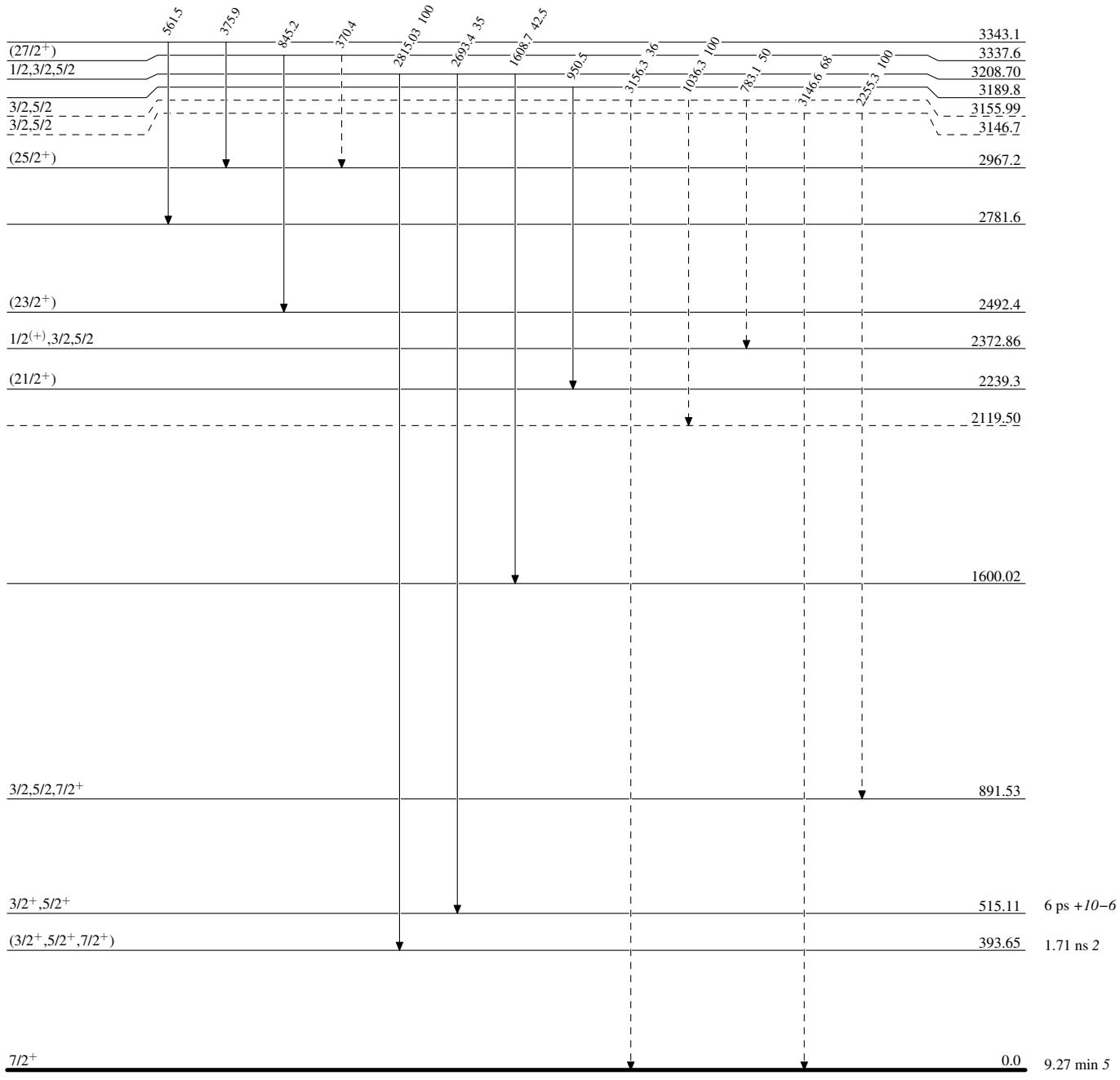
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

γ Decay (Uncertain)



$^{139}_{55}Cs_{84}$

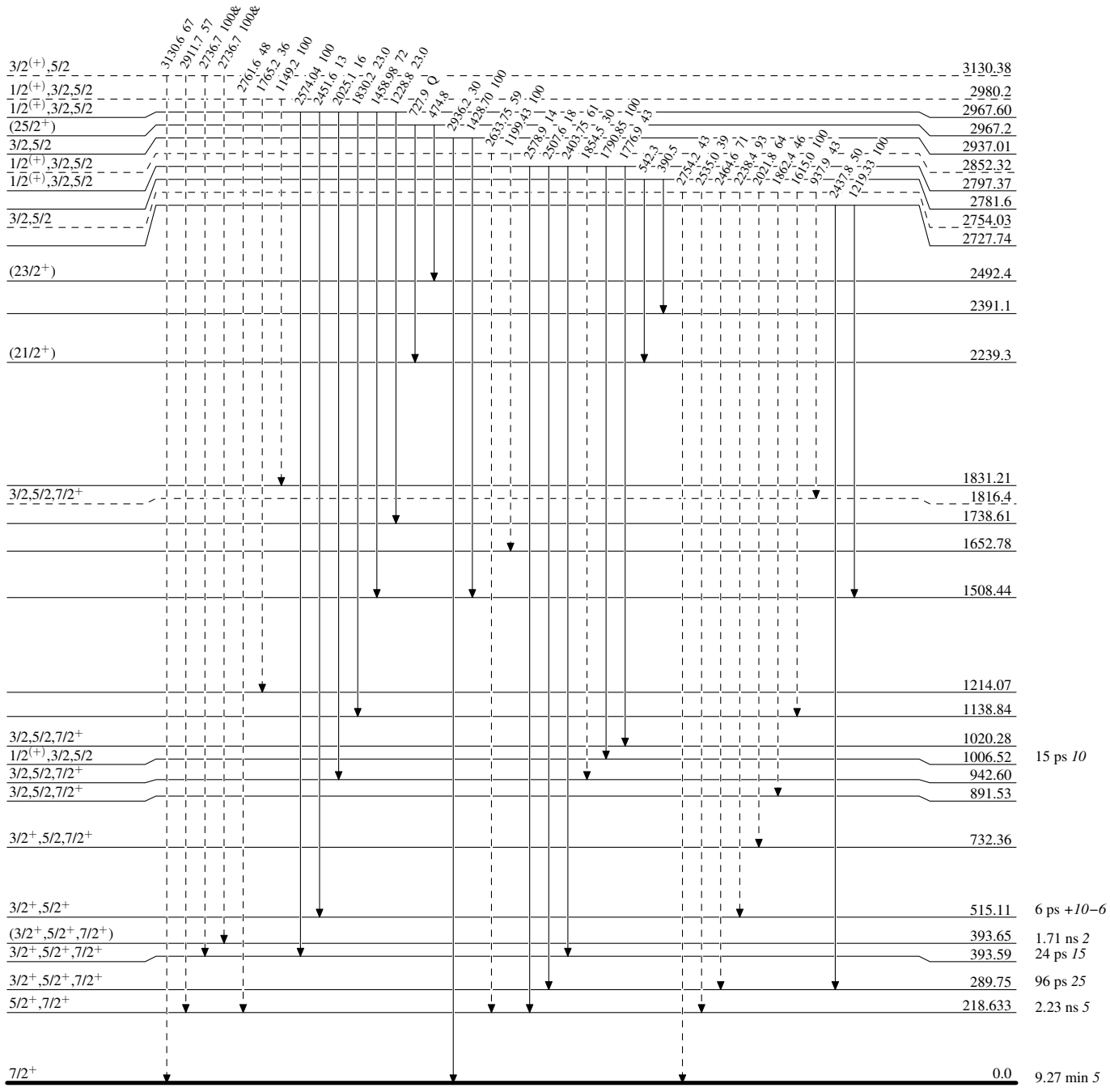
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

γ Decay (Uncertain)



$^{139}_{55}Cs_{84}$

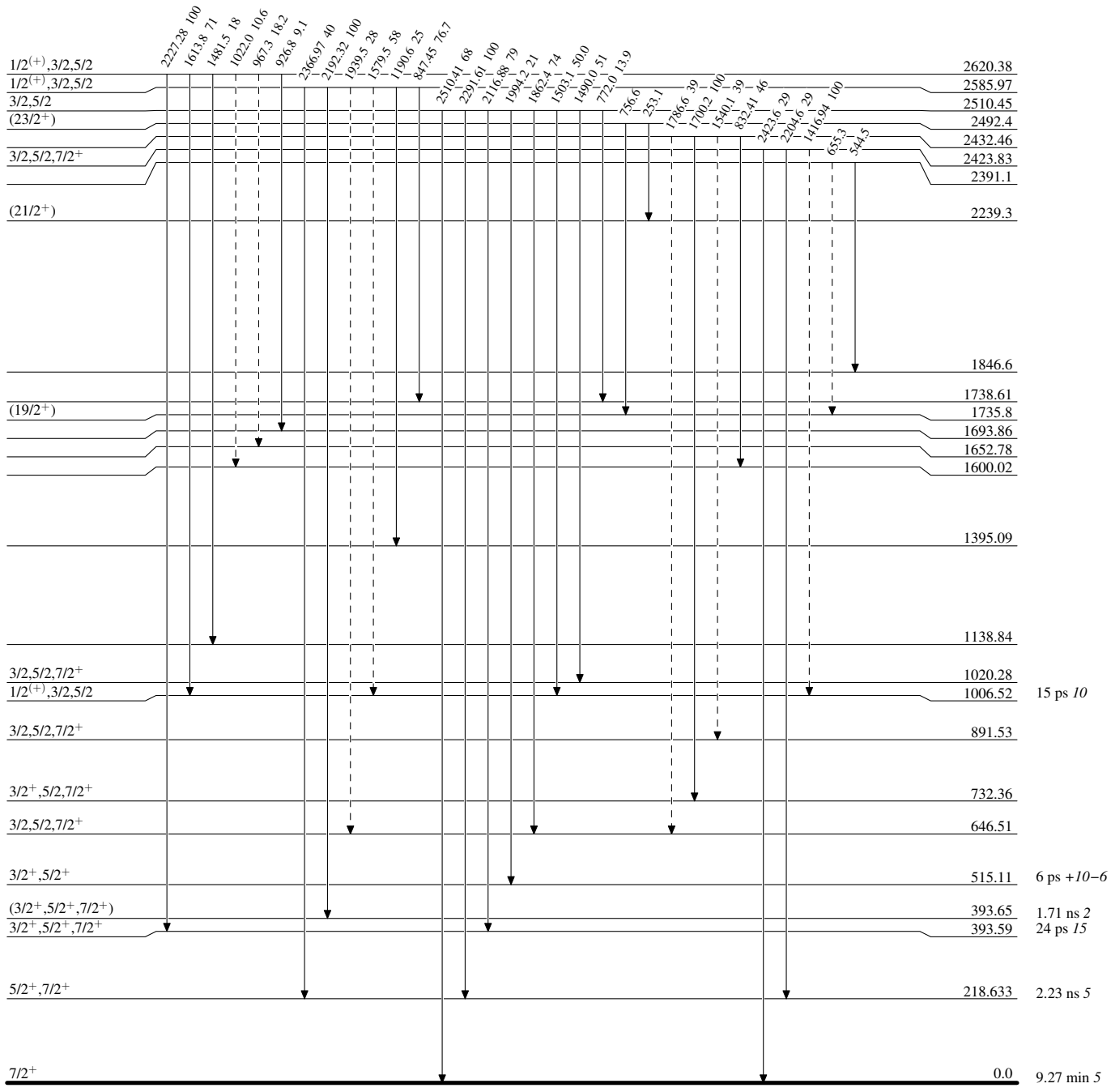
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given

– – – – – – ► γ Decay (Uncertain)



$^{139}_{55}Cs_{84}$

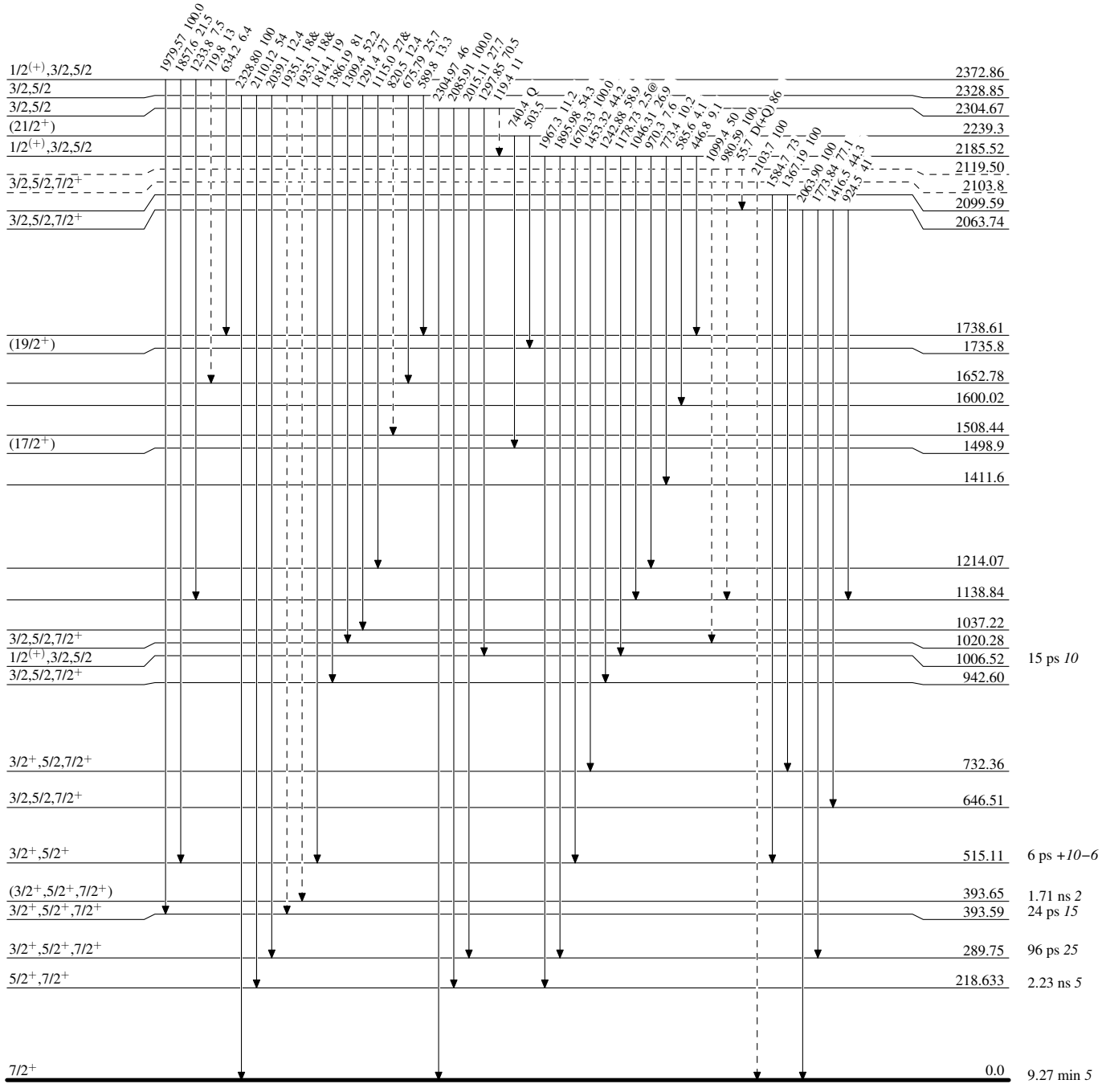
Adopted Levels, Gammas

Level Scheme (continued)

Legend

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

γ Decay (Uncertain)



$^{139}_{55}Cs_{84}$

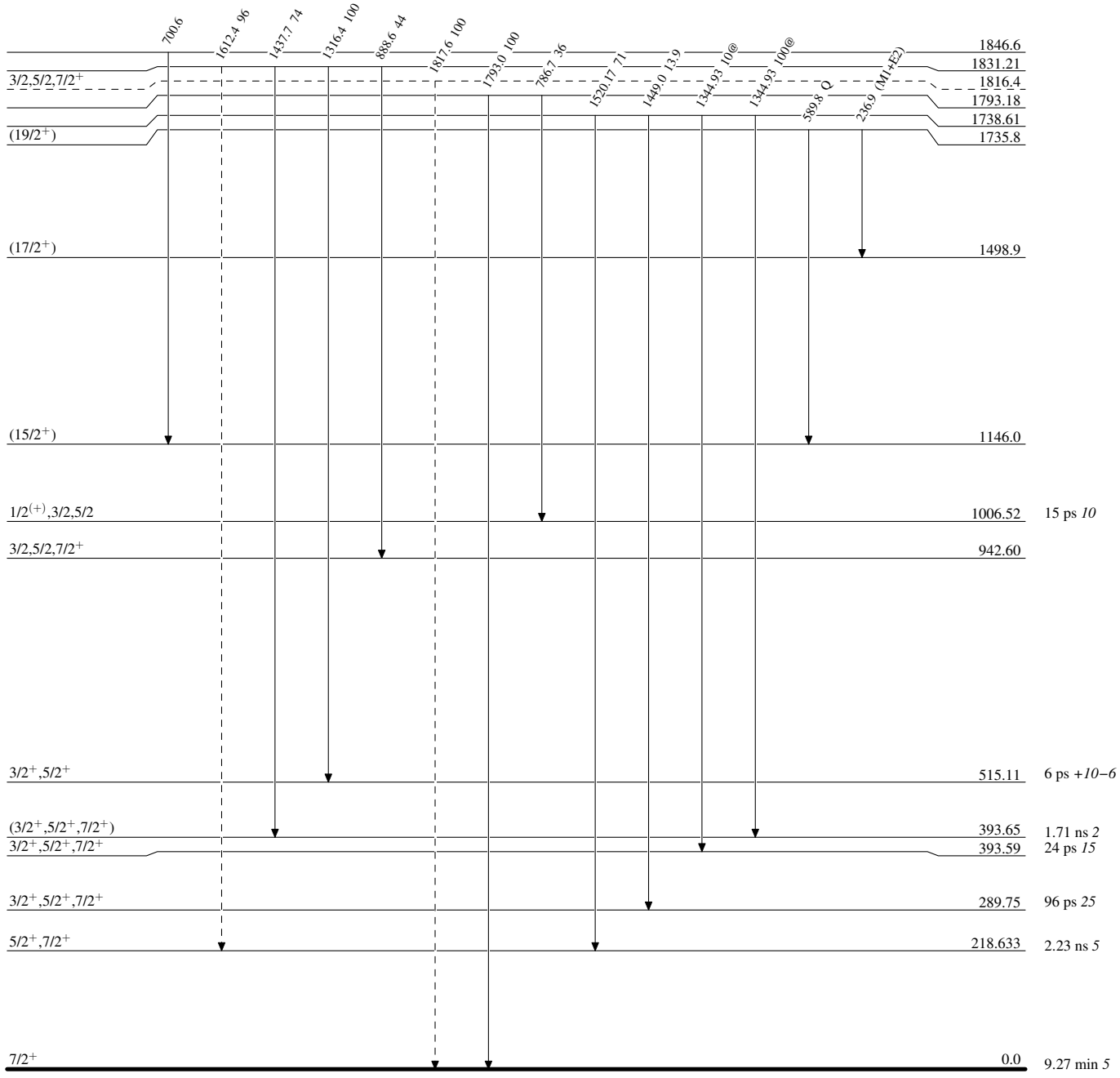
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

Legend

γ Decay (Uncertain)



$^{139}_{55}Cs_{84}$

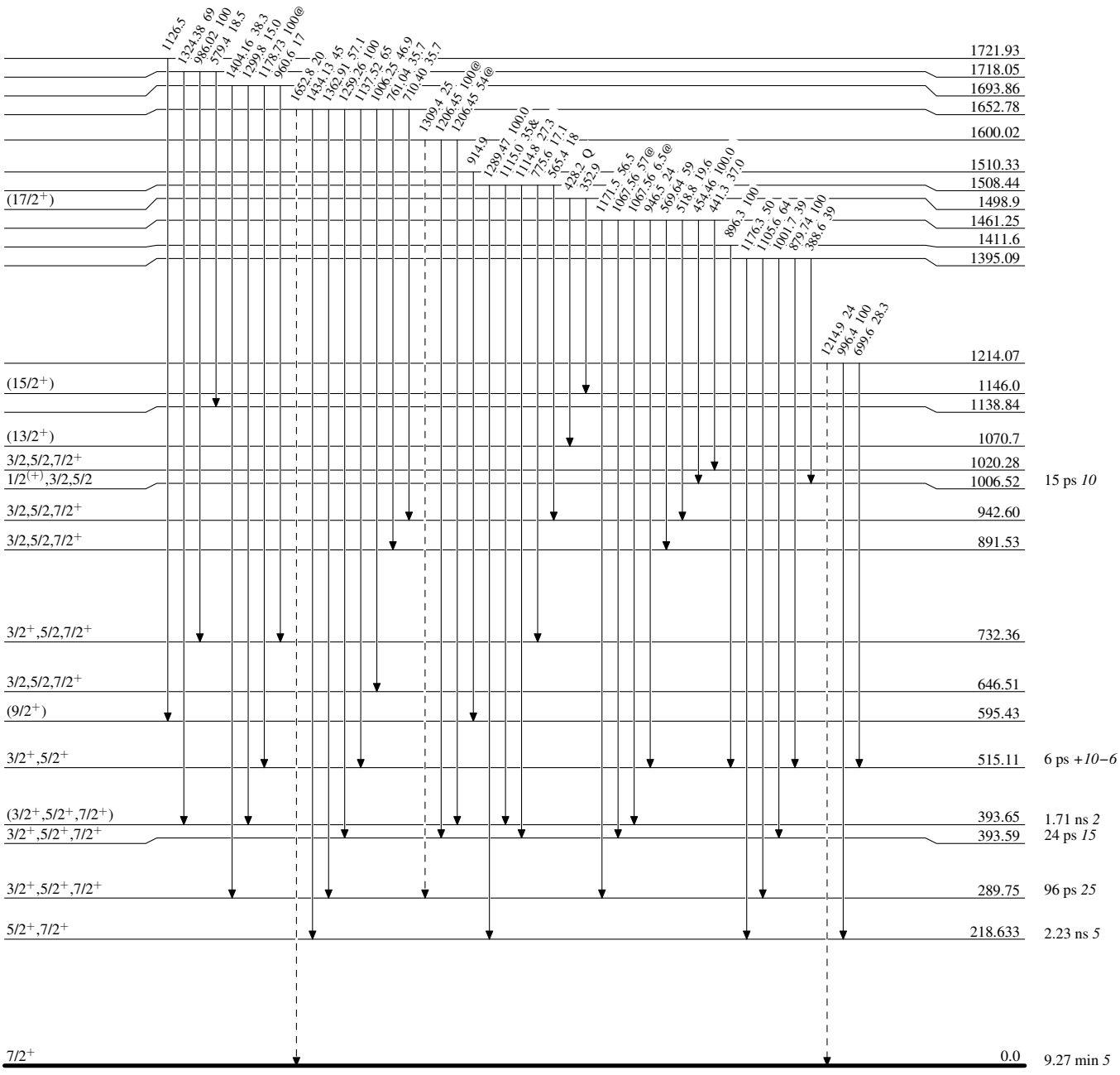
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided

Legend

– – – – – – ► γ Decay (Uncertain)

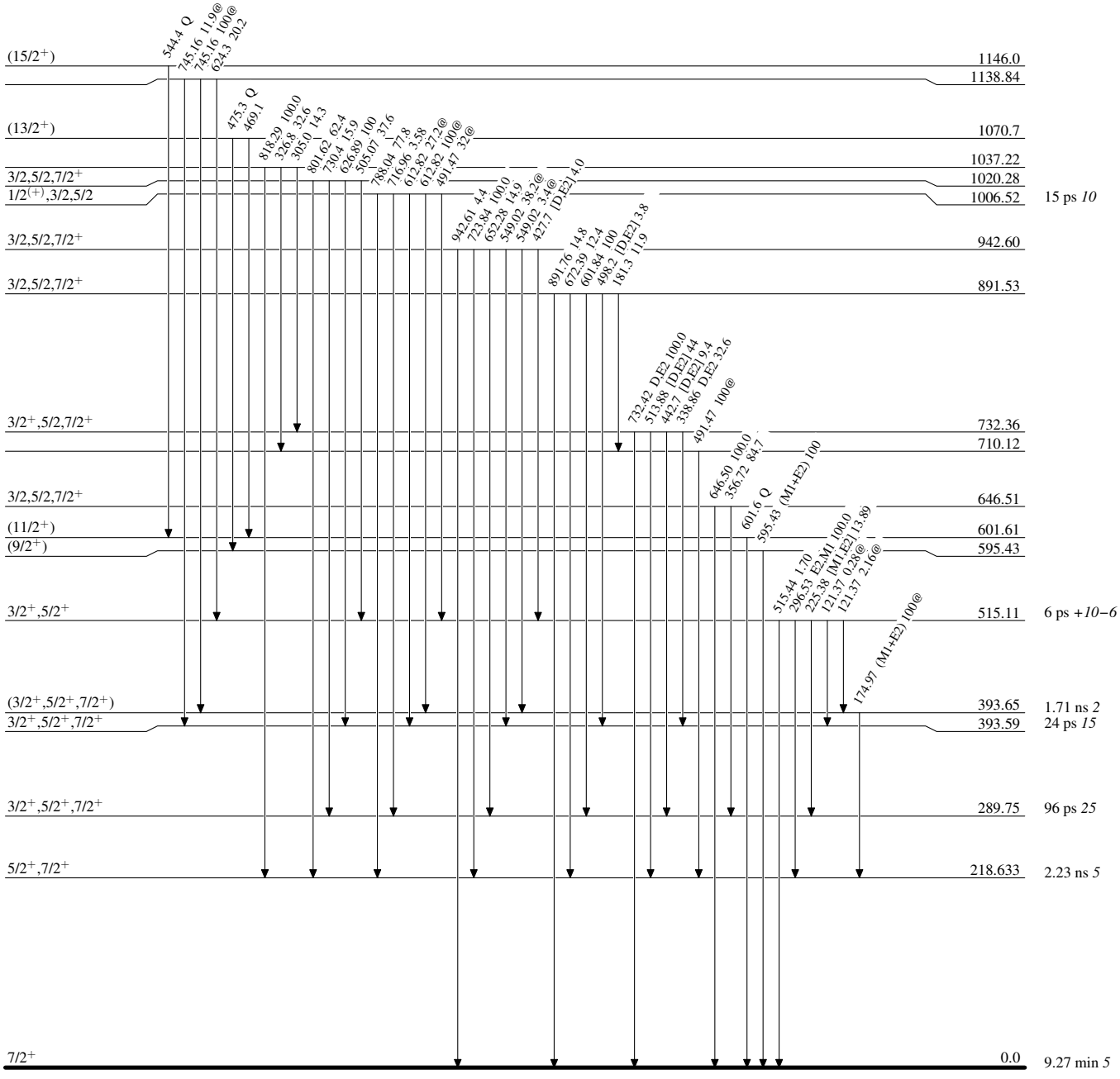


$^{139}_{55}Cs_{84}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
& Multiply placed: undivided intensity given
@ Multiply placed: intensity suitably divided



$^{139}_{55}Cs_{84}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level
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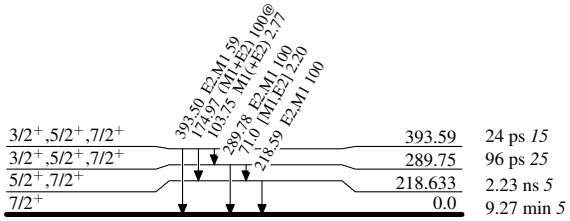
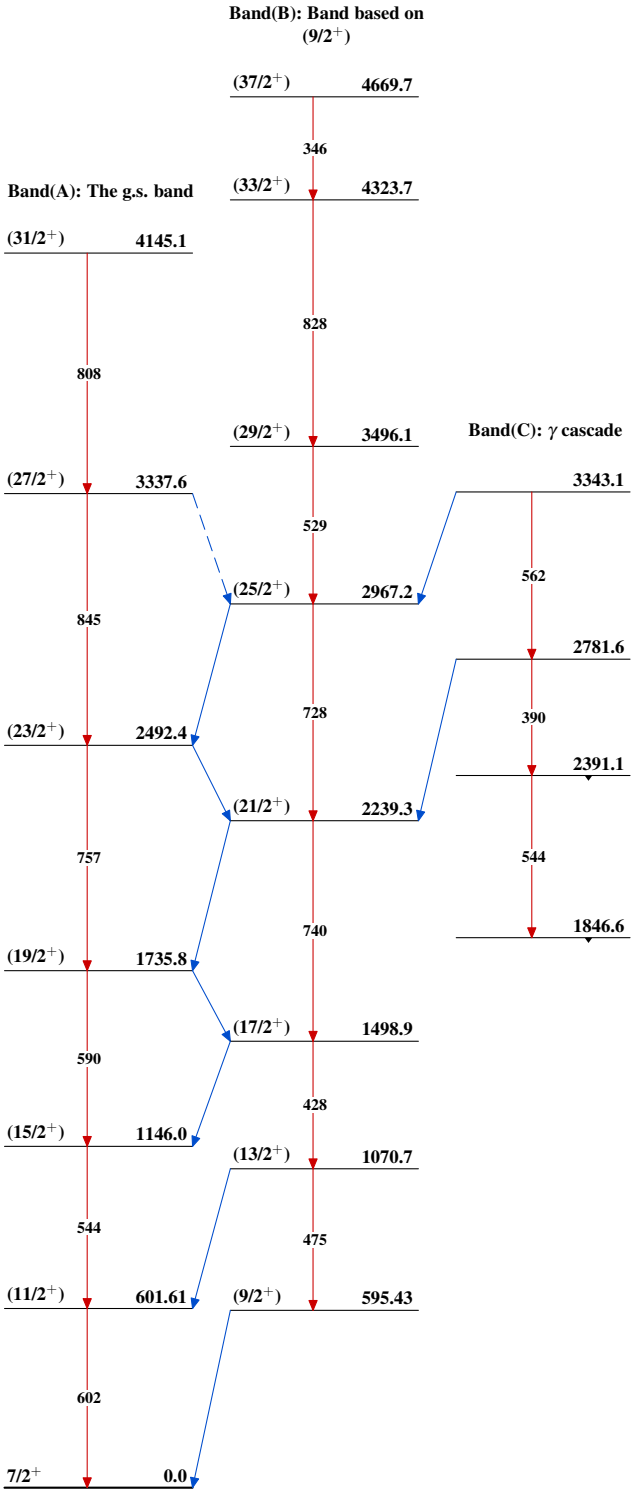


$^{139}_{55}Cs_{84}$

Adopted Levels, Gammas



$^{139}_{55}Cs_{84}$