Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh et al. ,	NDS 175, 1 (2021)	19-May-2021

Q(β^-)=−777 *10*; S(n)=6514 *8*; S(p)=3889 *7*; Q(α)=7448.6 *18* 2021Wa16
S(2n)=11840 *9*, S(2p)=10356 *8* (2021Wa16).
Additional information 1.
1948Gh01: ^{219}Fr identified in α decay chain: ^{227}Pa→^{223}Ac→^{219}Fr, where ^{227}Pa was produced at the 184-inch Berkeley cyclotron. Short half-life for the decay of ^{219}Fr was deduced. Later studies at Berkeley by 1951Me10, 1963Su10 and 1964Hy02 measured a more definite half-life of ^{219}Fr decay.
2014Bu06, 2015De28: measured hyperfine spectra, magnetic dipole moment, electric quadrupole moment and rms charge radius by Collinear Resonance Ionization Spectroscopy (CRIS) using HRS mass separator, ISCOOL gas-filled segmented linear Paul trap, and RILIS at ISOLDE-CERN facility. Both the measurements are for the ground state.
Some aspects of the level scheme and band assignments as proposed by 1991Li19 (see also 1992Kv03, 2002Sh19) should be considered as tentative, as the J^π values are mostly based on band assignments, and theoretical calculations, without a clear evidence of association of some of the levels to particular bands, especially for closely spaced levels.
Theoretical calculations: 27 primary references in the NSR database (www.nndc.bnl.gov/nsr), eight related to structure calculations, and 19 to radioactivity.

^{219}Fr Levels

Configuration and band assignments are from 1991Li19 (see also 2002Sh19).

Cross Reference (XREF) Flags

A ^{223}Ac α decay (2.10 min)

E(level)†	J$^\pi$#	T$_{1/2}$	XREF	Comments
0.0&	9/2$^-$	24 ms *4*	A	%α=100 μ=+3.13 *4* (2015De28,2014Bu06) Q=−1.21 *2* (2015De28) δ<r^2>(^{219}Fr,^{221}Fr)=−0.272 fm^2 *6* (2014Bu06). isotope shift $\delta\nu$(^{219}Fr,^{221}Fr)=+5.59 GHz *10* (2014Bu06). μ,Q: measured by 2015De28, Collinear Resonance Ionization Spectroscopy. Values are relative to the magnetic dipole moment of +1.57 *2* and electric quadrupole moment of −1.00 *1* for the ground state of ^{221}Fr taken from literature. Other: μ=+3.11 *4* (2014Bu06, same group as 2015De28). Values are not available in 2014StZZ and 2016St14 evaluations. J$^\pi$: favored α decay (HF=1.1) to ^{215}At g.s. (J^π=9/2$^-$). T$_{1/2}$: unweighted average of 28 ms *3* (2018Sa45) and 20 ms *2* (1951Me10). Others: 21.5 ms (1963Su10,1964Hy02); ≈0.1 ms (1948Gh01).
15.0& *1*	(5/2$^-$)		A	
56.1b *1*	(3/2$^-$)		A	
73?& *1*	(13/2$^-$)		A	
81.0& *5*	(1/2$^-$)		A	
98.58b *5*	(7/2$^-$)		A	J$^\pi$: parity from 98.6, (M1) γ to 9/2$^-$ g.s.
134.4b *1*	(5/2$^-$)		A	J$^\pi$: parity from 35.7, (M1) γ to (7/2$^-$), 98.6 level.
139.8& *1*	(3/2$^-$)		A	
191.29a *6*	(7/2$^+$)		A	J$^\pi$: γ to (7/2$^-$), 98.6 level, possible band member.
210.4a *2*	(3/2$^+$)		A	
216.0a *1*	(11/2$^+$)		A	

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Adopted Levels, Gammas (continued)

^{219}Fr Levels (continued)

E(level)[†]	Jπ[#]	XREF	Comments
269.2[&] *1*	(7/2⁻)	A	
305.5[b] *1*	(9/2⁻)	A	
325?[‡@] *2*		A	Jπ: possible (5/2⁻).
333.5[&] *1*	(11/2⁻)	A	
340.3[c] *1*	(5/2⁺)	A	
369.5[c] *2*	(3/2⁺)	A	Jπ: 1991Li19 assign π=+ or -, band association favors positive parity.
372.4[c] *1*	(7/2⁺)	A	
374.8[@] *2*	(7/2)	A	Jπ: possible negative parity.
384.3[a] *1*	(5/2⁺)	A	
432.0[@] *2*	(9/2)	A	Jπ: possible negative parity.
445?[‡] *4*		A	
462.2[c] *5*	(9/2⁺)	A	Jπ: 1991Li19 assign π=+ or -, band association favors positive parity.
490.3[d] *1*	(5/2⁻)	A	
506.5[a] *3*	(9/2⁺)	A	
530.0[c] *5*	(11/2⁺)	A	
533.8[d] *4*	(7/2⁻)	A	
589[d] *1*	(9/2⁻)	A	
650[‡d] *3*	(11/2⁻)	A	
705.5[e] *5*	(5/2⁺)	A	
778[‡e] *1*	(7/2⁺)	A	

[†] From ^{223}Ac α decay.
[‡] Weakly populated level by α branch, the gamma transition is either not confirmed or not observed.
[#] ^{219}Fr lies in the transitional region between quadrupole deformation and spherical shape ($\epsilon_2=\epsilon_3=0.08$). For some reason, however, this nucleus presents the typical structure of parity doublet bands (1990Li33,1991Li19). Most of the assigned spins and parities are based mainly on rotational band structure, γ-ray multipolarities and decay patterns, favored α decay from ^{223}Ac and to ^{215}At, and on a comparison with similar band structures observed in ^{221}Fr. See also 2002Sh19 for configurations. Assignments for the excited states are considered as tentative.
[@] Possible configuration=π5/2[523]+π5/2[512]+(π1/2[541]+Q_{30}).
[&] Band(A): $K^\pi=1/2^-$,π1/2[541], parity doublet band.
[a] Band(a): $K^\pi=1/2^+$, parity doublet band. Configuration=π1/2[411]+(π1/2[541]+Q_{30}).
[b] Band(B): $K^\pi=3/2^-$, parity doublet band. Configuration=π3/2[532]+(π3/2[402]+Q_{30}).
[c] Band(b): $K^\pi=3/2^+$, parity doublet band. Configuration=π3/2[402]+(π3/2[532]+Q_{30}).
[d] Band(C): $K^\pi=5/2^-$, parity doublet band. Configuration=π5/2[512]+π5/2[523]+(π1/2[660]+Q_{30}).
[e] Band(c): $K^\pi=5/2^+$, parity doublet band. Configuration=π5/2[402]+(π5/2[523]+Q_{30}).

γ(^{219}Fr)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[†]	δ[†]	α[‡]	Comments
15.0	(5/2⁻)	(15.0)	100	0.0	9/2⁻	[E2]		2.36×10^4	α(M)=1.786×10^4 *25* α(N)=4.66×10^3 *7*; α(O)=959 *14*; α(P)=120.9 *17*; α(Q)=0.1125 *16*
56.1	(3/2⁻)	41.15 *10*	100	15.0	(5/2⁻)	(M1+E2)	1.0 *2*	3.3×10^2 *7*	α(L)=2.4×10^2 *5*; α(M)=65 *13* α(N)=17 *4*; α(O)=3.5 *7*; α(P)=0.46 *9*; α(Q)=0.0024 *3*
73?	(13/2⁻)	72.8[#@]	100	0.0	9/2⁻	[E2]		39.4	α(L)=29.0 *4*; α(M)=7.84 *11*

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Adopted Levels, Gammas (continued)

γ(^{219}Fr) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[†]	α[‡]	Comments
								α(N)=2.05 *3*; α(O)=0.425 *6*; α(P)=0.0544 *8*; α(Q)=0.0001003 *14*
81.0	(1/2$^-$)	66.0[@] *5*	100	15.0	(5/2$^-$)	[E2]	63 *3*	α(L)=46.4 *19*; α(M)=12.5 *5* α(N)=3.28 *13*; α(O)=0.68 *3*; α(P)=0.087 *4*; α(Q)=0.000149 *6*
98.58	(7/2$^-$)	42.4 *1*	1.4 *3*	56.1	(3/2$^-$)	(E2)	538 *10*	α(L)=397 *8*; α(M)=106.8 *20* α(N)=27.9 *5*; α(O)=5.76 *11*; α(P)=0.733 *14*; α(Q)=0.001019 *18*
		83.55 *10*	64 *4*	15.0	(5/2$^-$)	(M1)	4.75	α(L)=3.60 *6*; α(M)=0.859 *13* α(N)=0.225 *4*; α(O)=0.0504 *8*; α(P)=0.00808 *12*; α(Q)=0.000452 *7*
		98.58 *5*	100.0 *22*	0.0	9/2$^-$	(M1)	2.94	α(L)=2.23 *4*; α(M)=0.532 *8* α(N)=0.1395 *20*; α(O)=0.0312 *5*; α(P)=0.00500 *7*; α(Q)=0.000279 *4*
134.4	(5/2$^-$)	35.7 *1*	25 *4*	98.58	(7/2$^-$)	(M1)	57.5 *10*	α(L)=43.6 *8*; α(M)=10.41 *17* α(N)=2.73 *5*; α(O)=0.611 *10*; α(P)=0.0979 *16*; α(Q)=0.00549 *9*
		78.25 *10*	50 *6*	56.1	(3/2$^-$)	[M1]	5.75	α(L)=4.36 *7*; α(M)=1.040 *15* α(N)=0.273 *4*; α(O)=0.0610 *9*; α(P)=0.00978 *15*; α(Q)=0.000547 *8*
		119.4 *1*	100 *9*	15.0	(5/2$^-$)	(M1)	8.65	α(K)=6.96 *10*; α(L)=1.283 *19*; α(M)=0.306 *5* α(N)=0.0802 *12*; α(O)=0.0179 *3*; α(P)=0.00288 *4*; α(Q)=0.0001607 *23*
139.8	(3/2$^-$)	124.8 *1*	100	15.0	(5/2$^-$)	(M1)	7.63	α(K)=6.14 *9*; α(L)=1.130 *16*; α(M)=0.269 *4* α(N)=0.0706 *10*; α(O)=0.01579 *23*; α(P)=0.00253 *4*; α(Q)=0.0001414 *20*
191.29	(7/2$^+$)	56.95 *20*	6.4 *10*	134.4	(5/2$^-$)	[E1]	0.481 *9*	α(L)=0.365 *7*; α(M)=0.0886 *15* α(N)=0.0227 *4*; α(O)=0.00473 *8*; α(P)=0.000634 *11*; α(Q)=1.93×10^{-5} *3*
		92.71 *5*	66 *3*	98.58	(7/2$^-$)	[E1]	0.1309	α(L)=0.0993 *14*; α(M)=0.0239 *4* α(N)=0.00616 *9*; α(O)=0.001310 *19*; α(P)=0.000185 *3*; α(Q)=6.59×10^{-6} *10*
		176.3 *2*	19 *3*	15.0	(5/2$^-$)	[E1]	0.1194	α(K)=0.0951 *14*; α(L)=0.0185 *3*; α(M)=0.00441 *7* α(N)=0.001145 *17*; α(O)=0.000248 *4*; α(P)=3.68×10^{-5} *6*; α(Q)=1.545×10^{-6} *22*
		191.3 *1*	100 *7*	0.0	9/2$^-$	[E1]	0.098	α(K)=0.0783 *11*; α(L)=0.0150 *2*; α(M)=0.00358 *5* α(N)=0.000930 *13*; α(O)=0.000202 *3*; α(P)=3.01×10^{-5} *5*; α(Q)=1.287×10^{-6} *18*
210.4	(3/2$^+$)	195.4 *2*	100	15.0	(5/2$^-$)	(E1)	0.0932	α(K)=0.0745 *11*; α(L)=0.01424 *21*; α(M)=0.00340 *5* α(N)=0.000881 *13*; α(O)=0.000191 *3*; α(P)=2.86×10^{-5} *4*; α(Q)=1.227×10^{-6} *18*
216.0	(11/2$^+$)	216.0 *1*	100	0.0	9/2$^-$	[E1]	0.0734	α(K)=0.0588 *9*; α(L)=0.01107 *16*; α(M)=0.00264 *4* α(N)=0.000685 *10*; α(O)=0.0001491 *21*; α(P)=2.24×10^{-5} *4*; α(Q)=9.82×10^{-7} *14*
269.2	(7/2$^-$)	134.6 *3*	≈10	134.4	(5/2$^-$)	[M1+E2]	4.3 *18*	α(K)=2.6 *24*; α(L)=1.28 *37*; α(M)=0.33 *12*

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Adopted Levels, Gammas (continued)

γ(^{219}Fr) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[†]	α[‡]	Comments
								α(N)=0.087 *30*; α(O)=0.0185 *58*; α(P)=0.0026 *6*; α(Q)=6.3×10^{-5} *51*
269.2	(7/2$^-$)	254.4 *3*	70 *20*	15.0	(5/2$^-$)	[M1+E2]	0.63 *40*	α(K)=0.46 *37*; α(L)=0.128 *23*; α(M)=0.032 *4* α(N)=0.0084 *10*; α(O)=0.0018 *3*; α(P)=0.00027 *7*; α(Q)=1.06×10^{-5} *82*
		269.2 *1*	100 *20*	0.0	9/2$^-$	[M1+E2]	0.54 *34*	α(K)=0.40 *31*; α(L)=0.107 *22*; α(M)=0.027 *4* α(N)=0.0070 *11*; α(O)=0.0015 *3*; α(P)=2.28×10^{-4} *60*; α(Q)=9.1×10^{-6} *70*
305.5	(9/2$^-$)	89.6 *2*	26 *5*	216.0	(11/2$^+$)	[E1]	0.1433 *22*	α(L)=0.1087 *17*; α(M)=0.0262 *4* α(N)=0.00675 *11*; α(O)=0.001433 *22*; α(P)=0.000202 *3*; α(Q)=7.11×10^{-6} *11*
		207.0 *2*	100 *21*	98.58	(7/2$^-$)	[M1+E2]	1.2 *7*	α(K)=0.8 *7*; α(L)=0.258 *11*; α(M)=0.0652 *17* α(N)=0.0171 *5*; α(O)=0.00370 *7*; α(P)=0.00054 *6*; α(Q)=1.9×10^{-5} *15*
		305.5 *1*	95 *11*	0.0	9/2$^-$	[M1+E2]	0.38 *25*	α(K)=0.28 *22*; α(L)=0.071 *20*; α(M)=0.018 *4* α(N)=0.0046 *11*; α(O)=1.01×10^{-3} *26*; α(P)=1.53×10^{-4} *50*; α(Q)=6.5×10^{-6} *49*
333.5	(11/2$^-$)	64.4 *3*	≈18	269.2	(7/2$^-$)	[E2]	70.8 *19*	α(L)=52.2 *14*; α(M)=14.1 *4* α(N)=3.69 *10*; α(O)=0.764 *21*; α(P)=0.098 *3*; α(Q)=0.000164 *4*
		333.5 *1*	100 *36*	0.0	9/2$^-$	[M1+E2]	0.30 *19*	α(K)=0.22 *17*; α(L)=0.054 *17*; α(M)=0.0133 *36* α(N)=0.00350 *94*; α(O)=7.7×10^{-4} *23*; α(P)=1.17×10^{-4} *42*; α(Q)=5.1×10^{-6} *38*
340.3	(5/2$^+$)	205.7 *3*	20 *10*	134.4	(5/2$^-$)	[E1]	0.0824	α(K)=0.0659 *10*; α(L)=0.01251 *19*; α(M)=0.00298 *5* α(N)=0.000774 *12*; α(O)=0.0001683 *25*; α(P)=2.52×10^{-5} *4*; α(Q)=1.095×10^{-6} *16*
		241.7 *2*	90 *10*	98.58	(7/2$^-$)	[E1]	0.0563	α(K)=0.0452 *7*; α(L)=0.00839 *12*; α(M)=0.00200 *3* α(N)=0.000519 *8*; α(O)=0.0001131 *16*; α(P)=1.709×10^{-5} *25*; α(Q)=7.67×10^{-7} *11*
		284.2 *1*	100 *10*	56.1	(3/2$^-$)	[E1]	0.0387	α(K)=0.0312 *5*; α(L)=0.00567 *8*; α(M)=0.001346 *19* α(N)=0.000350 *5*; α(O)=7.66×10^{-5} *11*; α(P)=1.167×10^{-5} *17*; α(Q)=5.39×10^{-7} *8*
		325.3 *1*	25 *10*	15.0	(5/2$^-$)	[E1]	0.0285	α(K)=0.0231 *4*; α(L)=0.00412 *6*; α(M)=0.000977 *14* α(N)=0.000254 *4*; α(O)=5.58×10^{-5} *8*; α(P)=8.55×10^{-6} *12*; α(Q)=4.05×10^{-7} *6*
369.5	(3/2$^+$)	229.7 *2*	100	139.8	(3/2$^-$)	[E1]	0.0634	α(K)=0.0509 *8*; α(L)=0.00951 *14*; α(M)=0.00226 *4* α(N)=0.000588 *9*; α(O)=0.0001281 *19*; α(P)=1.93×10^{-5} *3*; α(Q)=8.57×10^{-7} *13*
372.4	(7/2$^+$)	238.1 *2*	39 *6*	134.4	(5/2$^-$)	[E1]	0.0583	α(K)=0.0468 *7*; α(L)=0.00870 *13*; α(M)=0.00207 *3* α(N)=0.000538 *8*; α(O)=0.0001173 *17*; α(P)=1.77×10^{-5} *3*; α(Q)=7.92×10^{-7} *12*

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Adopted Levels, Gammas (continued)

γ(^{219}Fr) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[†]	α[‡]	Comments
372.4	(7/2$^+$)	274.0 *2*	28 *6*	98.58	(7/2$^-$)	[E1]	0.0421	α(K)=0.0339 *5*; α(L)=0.00618 *9*; α(M)=0.001470 *21* α(N)=0.000382 *6*; α(O)=8.35×10^{-5} *12*; α(P)=1.271×10^{-5} *18*; α(Q)=5.84×10^{-7} *9*
		357.4 *1*	100 *17*	15.0	(5/2$^-$)	[E1]	0.0232	α(K)=0.0188 *3*; α(L)=0.00332 *5*; α(M)=0.000786 *11* α(N)=0.000204 *3*; α(O)=4.49×10^{-5} *7*; α(P)=6.91×10^{-6} *10*; α(Q)=3.33×10^{-7} *5*
		372.4 *1*	89 *17*	0.0	9/2$^-$	[E1]	0.0212	α(K)=0.01720 *25*; α(L)=0.00302 *5*; α(M)=0.000715 *10* α(N)=0.000186 *3*; α(O)=4.09×10^{-5} *6*; α(P)=6.31×10^{-6} *9*; α(Q)=3.05×10^{-7} *5*
374.8	(7/2)	374.8 *2*	100	0.0	9/2$^-$	[D,E2]	0.19 *17*	
384.3	(5/2$^+$)	285.7 *1*	100	98.58	(7/2$^-$)	[E1]	0.0382	α(K)=0.0309 *5*; α(L)=0.00560 *8*; α(M)=0.001329 *19* α(N)=0.000346 *5*; α(O)=7.56×10^{-5} *11*; α(P)=1.152×10^{-5} *17*; α(Q)=5.33×10^{-7} *8*
432.0	(9/2)	126.4 *2*	≈25	305.5	(9/2$^-$)	[D,E2]	3.8 *35*	
		216.1 *2*	100 *50*	216.0	(11/2$^+$)	[D,E2]	0.84 *77*	
462.2	(9/2$^+$)	462.2 *5*	100	0.0	9/2$^-$	[E1]	0.01339	α(K)=0.01093 *16*; α(L)=0.00187 *3*; α(M)=0.000442 *7* α(N)=0.0001152 *17*; α(O)=2.54×10^{-5} *4*; α(P)=3.95×10^{-6} *6*; α(Q)=1.98×10^{-7} *3*
490.3	(5/2$^-$)	279.8 *3*	5.7 *19*	210.4	(3/2$^+$)	[E1]	0.0401	α(K)=0.0323 *5*; α(L)=0.00588 *9*; α(M)=0.001398 *20* α(N)=0.000363 *6*; α(O)=7.95×10^{-5} *12*; α(P)=1.210×10^{-5} *18*; α(Q)=5.58×10^{-7} *8*
		299.1 *2*	5.7 *19*	191.29	(7/2$^+$)	[E1]	0.0344	α(K)=0.0278 *4*; α(L)=0.00502 *7*; α(M)=0.001191 *17* α(N)=0.000310 *5*; α(O)=6.78×10^{-5} *10*; α(P)=1.036×10^{-5} *15*; α(Q)=4.84×10^{-7} *7*
		434.2 *1*	100 *9*	56.1	(3/2$^-$)	[M1+E2]	0.145 *93*	α(K)=0.112 *81*; α(L)=0.025 *10*; α(M)=0.0060 *23* α(N)=0.00158 *59*; α(O)=3.5×10^{-4} *14*; α(P)=5.4×10^{-5} *24*; α(Q)=2.5×10^{-6} *18*
		475.2 *1*	51 *8*	15.0	(5/2$^-$)	[M1+E2]	0.114 *73*	α(K)=0.089 *63*; α(L)=0.0190 *81*; α(M)=0.0046 *19* α(N)=0.00121 *48*; α(O)=2.7×10^{-4} *11*; α(P)=4.2×10^{-5} *19*; α(Q)=2.0×10^{-6} *14*
506.5	(9/2$^+$)	315.2 *3*	33	191.29	(7/2$^+$)	[M1+E2]	0.35 *23*	α(K)=0.26 *20*; α(L)=0.065 *19*; α(M)=0.016 *4* α(N)=0.0042 *10*; α(O)=9.1×10^{-4} *25*; α(P)=1.39×10^{-4} *47*; α(Q)=5.9×10^{-6} *45*
		506.6 *5*	100 *67*	0.0	9/2$^-$	[E1]	0.0111	α(K)=0.00907 *13*; α(L)=0.001540 *22*; α(M)=0.000363 *6* α(N)=9.46×10^{-5} *14*; α(O)=2.09×10^{-5} *3*; α(P)=3.26×10^{-6} *5*; α(Q)=1.651×10^{-7} *24*
530.0	(11/2$^+$)	530.0 *5*	100	0.0	9/2$^-$	[E1]	0.01013	α(K)=0.00829 *12*; α(L)=0.001401 *20*; α(M)=0.000330 *5*

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Adopted Levels, Gammas (continued)

γ(^{219}Fr) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[†]	α[‡]	Comments
533.8	(7/2$^-$)	518.8 *4*	100	15.0	(5/2$^-$)	[M1+E2]	0.091 *57*	α(N)=8.60×10^{-5} *13*; α(O)=1.90×10^{-5} *3*; α(P)=2.97×10^{-6} *5*; α(Q)=1.513×10^{-7} *22* α(K)=0.071 *49*; α(L)=0.0148 *66*; α(M)=0.0036 *15* α(N)=9.4×10^{-4} *39*; α(O)=2.09×10^{-4} *90*; α(P)=3.3×10^{-5} *16*; α(Q)=1.6×10^{-6} *11*
589	(9/2$^-$)	82.4[@]	100	506.5	(9/2$^+$)	[E1]	0.179	α(L)=0.1359 *19*; α(M)=0.0328 *5* α(N)=0.00844 *12*; α(O)=0.00179 *3*; α(P)=0.000250 *4*; α(Q)=8.57×10^{-6} *12*
705.5	(5/2$^+$)	171.7 *3*	100 *50*	533.8	(7/2$^-$)	[E1]	0.1273	α(K)=0.1013 *15*; α(L)=0.0198 *3*; α(M)=0.00472 *7* α(N)=0.001225 *18*; α(O)=0.000265 *4*; α(P)=3.93×10^{-5} *6*; α(Q)=1.640×10^{-6} *24*
		199.3[@] *4*	15×10[1] *10*	506.5	(9/2$^+$)	[E2]	0.560 *9*	
778	(7/2$^+$)	72.8[#@]	100	705.5	(5/2$^+$)	[M1+E2]	23 *17*	α(L)=17 *12*; α(M)=4.6 *33* α(N)=1.20 *86*; α(O)=0.25 *18*; α(P)=0.033 *22*; α(Q)=3.9×10^{-4} *29*

[†] From ^{223}Ac α 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.
[#] Multiply placed.
[@] Placement of transition in the level scheme is uncertain.

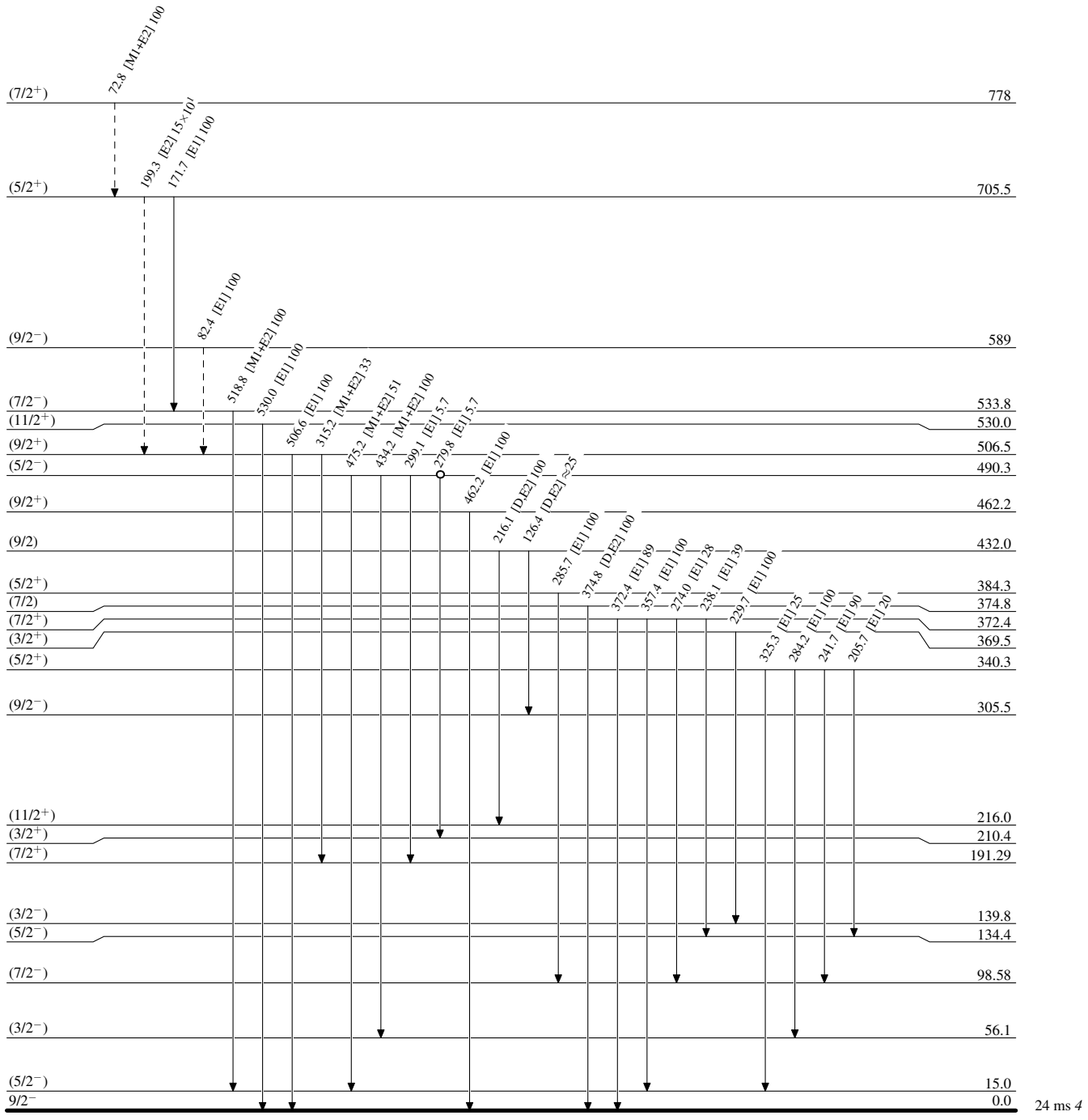
Legend

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level

γ Decay (Uncertain)
Coincidence
Coincidence (Uncertain)



$^{219}_{87}Fr_{132}$

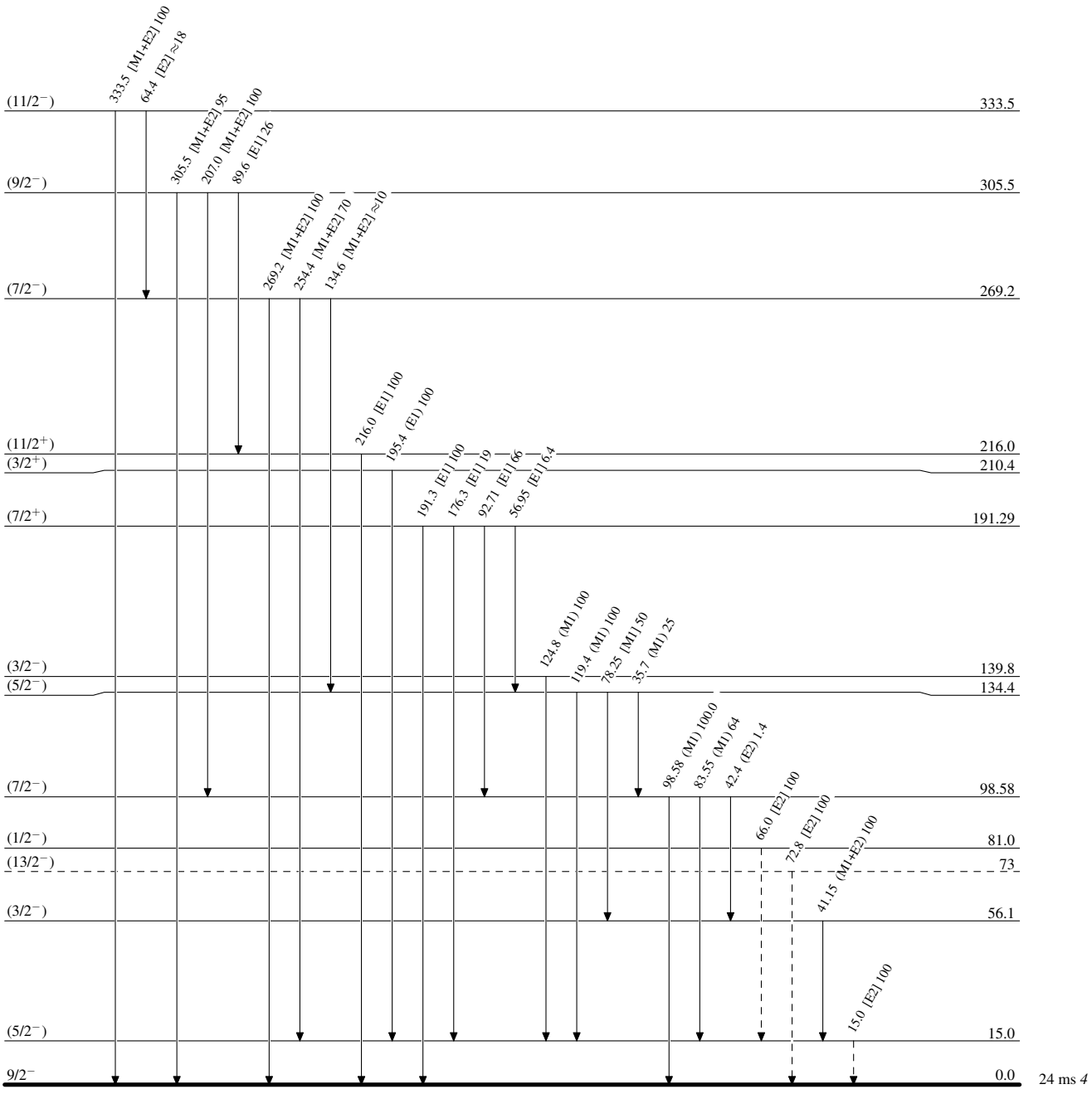
Adopted Levels, Gammas

Legend

Level Scheme (continued)

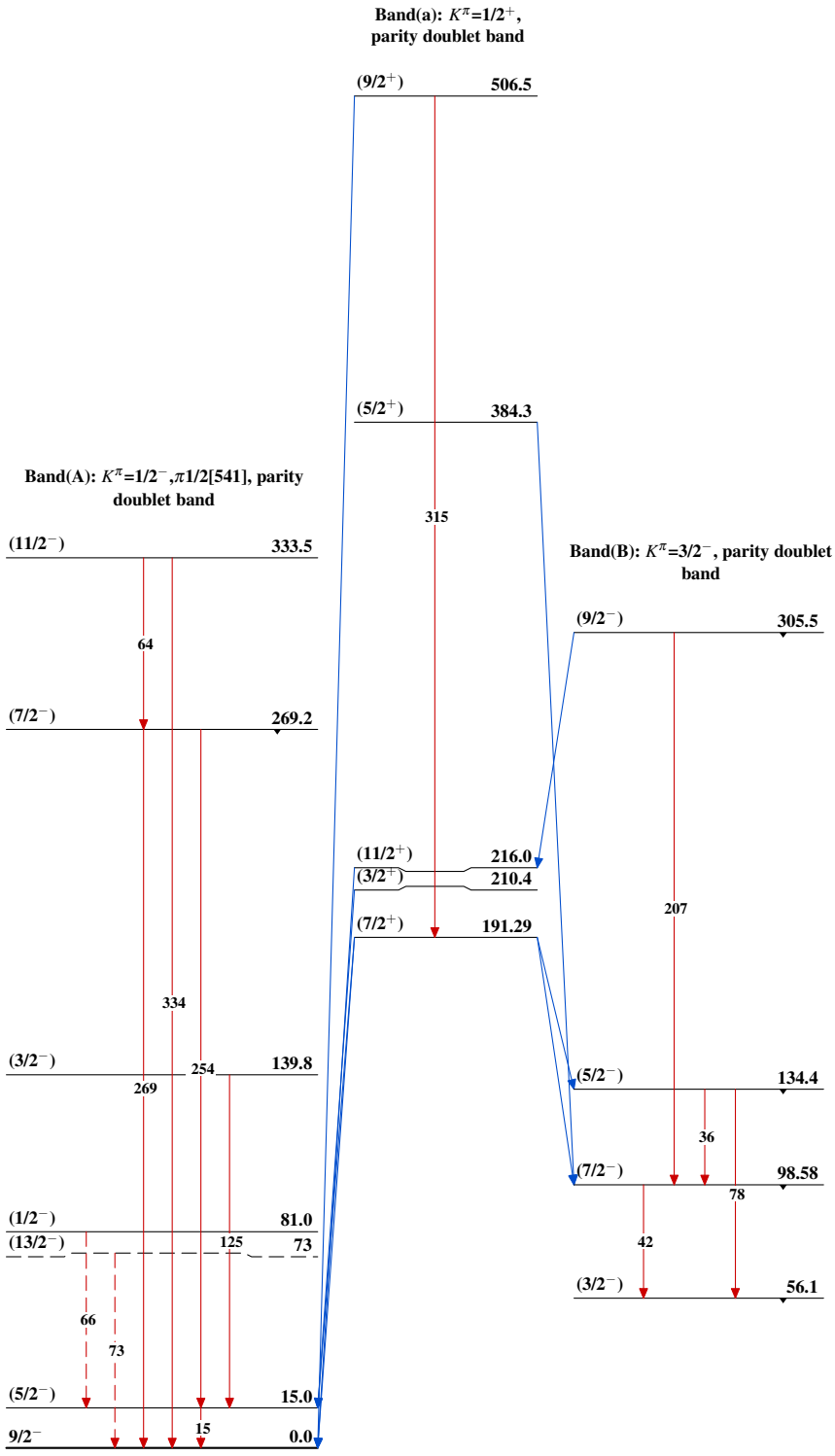
Intensities: Relative photon branching from each level

γ Decay (Uncertain)



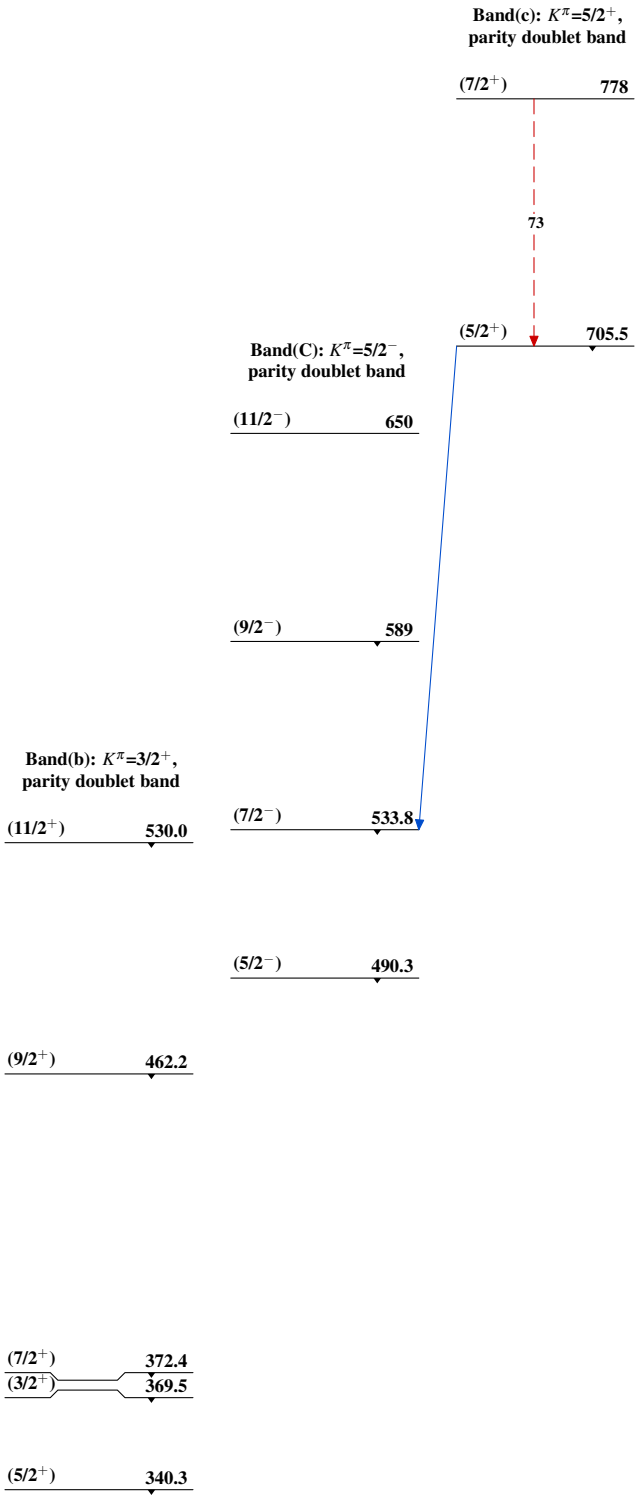
$^{219}_{87}Fr_{132}$

Adopted Levels, Gammas



$^{219}_{87}Fr_{132}$

Adopted Levels, Gammas (continued)



$^{219}_{87}Fr_{132}$