^{86}Kr(α,3nγ), ^{84}Kr(α,nγ) 1981Ek01,1975Ar06

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	T. D. Johnson and W. D. Kulp(a)	NDS 129, 1 (2015)	27-Jul-2015

1981Ek01: ^{84}Kr(α,nγ), E=11-17 MeV, Ge detectors, measured γ spectra, angular distributions, linear polarization, excitation functions, γγ coincidences, and DSA half-life measurements.

1975Ar06: ^{84}Kr(α,xnγ), E=10-14 MeV and ^{86}Kr(α,3nγ), E=11-40 MeV, Ge detectors, measured γ spectra, angular distributions, γγ coincidences, and DSA half-life measurements.

^{87}Sr Levels

E(level)	J$^{\pi}$ †	$T_{1/2}$ ‡	Comments
0.0	9/2$^+$		
388.54 *18*	1/2$^-$	2.815 h *12*	$T_{1/2}$: from Adopted Levels. J$^{\pi}$: From Adopted Levels.
873.29 *24*	3/2$^-$	1.7 ps *7*	J$^{\pi}$: linear polarization measurments and additional arguments in Adopted Levels.
1228.36 *23*	5/2$^+$	1.0 ps *4*	J$^{\pi}$: from E1 γ to 3/2$^-$ level and E2 γ to 9/2$^+$ supported by γ(θ) and γ(pol).
1254.0 *3*	5/2$^-$	2.8 ps *+28−9*	J$^{\pi}$: γ(θ) and γ(pol) supporting E2 γ to 1/2$^-$; additional argument in Adopted Levels.
1740.0 *4*	13/2$^+$ #	0.28 ps *9*	J$^{\pi}$: γ yield function and yrast argument.
1770.7 *3*	5/2$^+$	5.5 ps *+63−21*	J$^{\pi}$: γ(θ) and polarization supporting E2 γ to 9/2$^+$; additional argument in Adopted Levels.
1919.9 *4*	7/2$^+$	0.15 ps *5*	J$^{\pi}$: γ(θ) and γ(pol) are consistent only with J$^{\pi}$=7/2$^+$ and J$^{\pi}$=11/2$^+$ (1981Ek01).
2109.8 *5*	3/2$^-$	0.10 ps *3*	J$^{\pi}$: Adopted Levels and consistent with γ(θ)) and polarization.
2153.5 *6*	(11/2)$^+$	<0.09 ps	J$^{\pi}$: γ(θ) and polarization supporting M1+E2 γ to 9/2$^+$; additional argument in Adopted Levels.
2168.8 *4*	(1/2$^+$)		
2235.7 *10*	9/2$^+$	0.15 ps *4*	J$^{\pi}$: γ(θ) and γ(pol) are consistent only with J$^{\pi}$=9/2$^+$ (1981Ek01).
2414.7 *3*	3/2$^-$	0.12 ps *4*	J$^{\pi}$: γ excitation function suggests J=(3/2) (1981Ek01).
2420.4 *8*	(5/2)$^-$	0.08 ps *4*	J$^{\pi}$: γ excitation function suggests J=(5/2) (1981Ek01). $T_{1/2}$: from measurement at E_{α}=11 Mev; at E_{α}=14 MeV 1981Ek01 measure 0.19 ps 4.
2536.3 *6*	11/2$^-$	0.19 ps *8*	J$^{\pi}$: from γ(θ) and γ(pol) for 591 γ 1981Ek01 derive J$^{\pi}$=11/2$^-$.
2550.0 *8*	(7/2)$^+$	0.22 ps *7*	J$^{\pi}$: γ excitation function suggests J=(7/2) (1981Ek01); further supported by γ(θ) and γ(pol).
2555.0 *7*	(9/2)$^-$	0.06 ps *4*	J$^{\pi}$: From Adopted Levels.
2596.0 *5*	13/2$^-$	1.0 ps *4*	J$^{\pi}$: Supported by γ(θ) and γ(pol) with additional argument in Adopted Levels.
2682.2 *6*	(3/2)$^+$	0.25 ps *9*	J$^{\pi}$: γ(θ), γ(pol), and excitation function in (α,nγ) favor J$^{\pi}$=(3/2)$^+$.
2704.3? *20*			E(level): not confirmed by 1981Ek01.
2706.9 *6*	7/2$^+$,9/2$^+$	0.55 ps *14*	J$^{\pi}$: From Adopted Levels.
2821.2 *6*	(9/2)$^+$	0.7 ps *3*	J$^{\pi}$: γ(θ) and polarization for 1050γ give 5/2$^+$,7/2$^+$, 9/2$^+$ and J γ excitation function suggests J ≥ 9/2 (1981Ek01).
2831.2 *5*	15/2$^-$	<0.35 ps	J$^{\pi}$: From Adopted Levels.
2920.8 *12*	7/2$^+$,9/2$^+$		J$^{\pi}$: From Adopted Levels.
3035.5 *5*			
3117.4 *6*	13/2$^-$	0.38 ps *12*	J$^{\pi}$: from γ(θ) and γ(pol) 1981Ek01 derive J$^{\pi}$=13/2$^-$.
3155.0 *15*			
3249.4 *5*	(17/2)$^-$ #	1.3 ps *+16−6*	J$^{\pi}$: from γ(θ), γ(pol), and excitation function.
3390.9 *6*	(19/2$^-$) #		J$^{\pi}$: yield function and additional arguments in Adopted Levels.
3610.9 *6*	(21/2) #		J$^{\pi}$: Yield functions.
3718.0 *6*	(19/2)		J$^{\pi}$: from γ yield functions and correlation of alignment to initial J.
4440.3 *10*	(23/2) #		J$^{\pi}$: presumably dipole γ to 21/2$^+$; from γ yield functions in it follows that 829 γ is part of the yrast cascade.

† Assignments are from these data while those from Adopted Levels are indicated.
‡ From DSAM analysis (1981Ek01), unless indicated otherwise.

Continued on next page (footnotes at end of table)

^{86}Kr(α,3nγ), ^{84}Kr(α,nγ) 1981Ek01,1975Ar06 (continued)

^{87}Sr Levels (continued)

From γ yield functions, 1975Ar06 conclude that the 1740-1091-418-142-220-829 cascade forms the yrast cascade whereby the 1740 transition is an E2 transition and the other transitions are dipole transitions.

γ(^{87}Sr)

coin: from 1981Ek01.

E_γ[†]	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	δ[#]	α[d]	Comments
141.5 *2*	14 *5*	3390.9	(19/2⁻)	3249.4	(17/2)⁻	(D)[a]			
220.0 *2*	1.6 *2*	3610.9	(21/2)	3390.9	(19/2⁻)	(D)[a]			
235.2[@] *4*	2.2	2831.2	15/2⁻	2596.0	13/2⁻				E_γ: Not reported by 1981Ek01. From Iγ(235γ)/Iγ(1091γ)=0.067 in 1975Ar06. A_2=−0.29 *11*, A_4=0 (1975Ar06).
327.1 *3*	1.85 *8*	3718.0	(19/2)	3390.9	(19/2⁻)				A_2=+0.39 *5*, A_4=−0.10 *7*.
355.1 *2*	17.9 *5*	1228.36	5/2⁺	873.29	3/2⁻	E1(+M2)	+0.07 *+2−5*	0.00280 *11*	B(E1)(W.u.)=(0.0012 *4*); B(M2)(W.u.)=(2.1×10^2 *14*) B(E1)(W.u.)=0.0012 *4* α(K)=0.00248 *9*; α(L)=0.000270 *11*; α(M)=4.52×10^{-5} *18* α(N)=5.65×10^{-6} *23*; α(O)=3.60×10^{-7} *14* A_2=−0.106 *18*, A_4=−0.005 *21*. Pol=+0.25 *5*. Mult.: M2 exceeds RUL by 1 to 2 σ. Using the minimum δ and maximum $T_{1/2}$, B(M2)(W.u.)>12, while the maximum δ and minimum $T_{1/2}$ yields B(M2)(W.u.)<575. The RUL limit is 1.
380.8 *3*	11 *4*	1254.0	5/2⁻	873.29	3/2⁻				
388.6[@b] *2*		388.54	1/2⁻	0.0	9/2⁺	M4			Mult.: From Adopted Levels.
418.2 *2*	20.0 *6*	3249.4	(17/2)⁻	2831.2	15/2⁻	M1+E2		0.0052 *12*	α(K)=0.0046 *11*; α(L)=0.00052 *13*; α(M)=8.7×10^{-5} *22* α(N)=1.1×10^{-5} *3*; α(O)=6.7×10^{-7} *14* A_2=−0.239 *16*, A_4=−0.007 *20*. Pol=−0.29 *5*.
484.9[@b] *3*	123 *4*	873.29	3/2⁻	388.54	1/2⁻	M1+E2	+0.19 *5*	0.00286 *5*	α(K)=0.00253 *5*; α(L)=0.000277 *5*; α(M)=4.66×10^{-5} *8* α(N)=5.85×10^{-6} *10*; α(O)=3.81×10^{-7} *6* A_2=−0.018 *18*, A_4=−0.023 *22*. Pol=−0.14 *2*.
517.3[&] *10*	10 *3*	1770.7	5/2⁺	1254.0	5/2⁻				
521.0[&] *7*	3.6 *2*	3117.4	13/2⁻	2596.0	13/2⁻	M1+E2	+0.29 *16*	0.00245 *9*	α(K)=0.00217 *8*; α(L)=0.000238 *10*; α(M)=3.99×10^{-5} *16* α(N)=5.01×10^{-6} *19*; α(O)=3.26×10^{-7} *11* A_2=+0.50 *8*, A_4=−0.09 *8*. Pol=+0.37 *23*.
542.3 *3*	15.1 *5*	1770.7	5/2⁺	1228.36	5/2⁺	M1(+E2)	−0.04 *8*	0.00217 *4*	α(K)=0.00192 *3*; α(L)=0.000210 *4*; α(M)=3.52×10^{-5} *6* α(N)=4.43×10^{-6} *7*; α(O)=2.90×10^{-7} *5* A_2=+0.139 *18*, A_4=−0.018 *22*. Pol=+0.25 *7*.
581.3 *5*	5.7 *2*	3117.4	13/2⁻	2536.3	11/2⁻	M1+E2	+0.047 *+12−23*	0.00185	α(K)=0.001640 *24*; α(L)=0.000179 *3*;

γ(^{87}Sr) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	δ[#]	α[d]	Comments
									α(M)=3.00×10^{-5} *5* α(N)=3.77×10^{-6} *6*; α(O)=2.47×10^{-7} *4* A_2=−0.21 *4*, A_4=0.00 *4*. Pol=−0.68 *15*.
691.8 *4*	9 *3*	1919.9	7/2$^+$	1228.36	5/2$^+$				POL=−0.02 *7*.
787.0 *4*	8.1 *3*	2706.9	7/2$^+$,9/2$^+$	1919.9	7/2$^+$	M1(+E2)	0.00 *9*	9.39×10^{-4}	α(K)=0.000832 *12*; α(L)=8.99×10^{-5} *13*; α(M)=1.509×10^{-5} *22* α(N)=1.90×10^{-6} *3*; α(O)=1.249×10^{-7} *18* A_2=−0.312 *23*, A_4=−0.012 *27*. Pol=−0.41 *15*.
[x]806.8[@] *6*									
829.4[@] *8*		4440.3	(23/2)	3610.9	(21/2)	(D)[a]			A_2=−0.25 *22*, A_4=0 (1975Ar06).
855.9 *3*	37.9 *11*	2596.0	13/2$^-$	1740.0	13/2$^+$	E1+(M2)	−0.10 *12*	0.00035 *6*	α(K)=0.00031 *6*; α(L)=3.4×10^{-5} *6*; α(M)=5.7×10^{-6} *10* α(N)=7.1×10^{-7} *13*; α(O)=4.6×10^{-8} *8* A_2=+0.299 *24*, A_4=+0.001 *28*. Pol=−0.62 *9*.
865.4[@b] *4*	64.4 *19*	1254.0	5/2$^-$	388.54	1/2$^-$	E2		8.17×10^{-4}	α(K)=0.000723 *11*; α(L)=7.93×10^{-5} *12*; α(M)=1.331×10^{-5} *19* α(N)=1.666×10^{-6} *24*; α(O)=1.068×10^{-7} *15* A_2=+0.190 *20*, A_4=−0.031 *24*. Pol=+0.30 *4*. δ: δ(M3/E2)=0.00 *+11−27*.
882.0[&] *8*	10 *3*	3035.5		2153.5	(11/2)$^+$				
911.5 *5*	6.2 *3*	2682.2	(3/2)$^+$	1770.7	5/2$^+$	M1+E2	−0.5 *+3−13*	6.90×10^{-4} *24*	α(K)=0.000611 *21*; α(L)=6.6×10^{-5} *3*; α(M)=1.11×10^{-5} *5* α(N)=1.40×10^{-6} *6*; α(O)=9.14×10^{-8} *24* A_2=+0.08 *4*, A_4=−0.01 *5*. Pol=−0.04 *17*.
[x]1034.4[@] *8*									
1050.5 *5*	7.5 *3*	2821.2	(9/2)$^+$	1770.7	5/2$^+$	E2		5.17×10^{-4}	α(K)=0.000458 *7*; α(L)=4.98×10^{-5} *7*; α(M)=8.35×10^{-6} *12* α(N)=1.047×10^{-6} *15*; α(O)=6.78×10^{-8} *10* A_2=+0.30 *3*, A_4=−0.01 *4*. Pol=0.29 *16*.
1091.3 *3*	32.9 *12*	2831.2	15/2$^-$	1740.0	13/2$^+$	E1(+M2)	+0.012 *17*	2.11×10^{-4}	α(K)=0.000188 *3*; α(L)=2.00×10^{-5} *3*; α(M)=3.35×10^{-6} *5* α(N)=4.22×10^{-7} *6*; α(O)=2.76×10^{-8} *4* A_2=−0.256 *16*, A_4=−0.021 *20*. Pol=+0.39 *5*. δ: δ(M2/E1)=+0.012 *17*.

$^{87}_{38}Sr_{49}$-4

γ(^{87}Sr) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	δ[#]	α[d]	Comments
1166.9[&] *12*	10.5 *4*	2420.4	(5/2)⁻	1254.0	5/2⁻	D+Q			A_2=+0.36 *3*, A_4=−0.03 *4*. Pol=−0.51 *25*.
1228.5[@b] *4*	100 *3*	1228.36	5/2⁺	0.0	9/2⁺	E2		3.78×10⁻⁴	α(K)=0.000324 *5*; α(L)=3.50×10⁻⁵ *5*; α(M)=5.88×10⁻⁶ *9* α(N)=7.38×10⁻⁷ *11*; α(O)=4.81×10⁻⁸ *7*; α(IPF)=1.261×10⁻⁵ *19* A_2=+0.107 *16*, a_4=−0.024 *20*. Pol=+0.14 *3*.
1236.5 *4*	8.9 *4*	2109.8	3/2⁻	873.29	3/2⁻	M1+E2		3.73×10⁻⁴	α(K)=0.000320 *5*; α(L)=3.44×10⁻⁵ *5*; α(M)=5.77×10⁻⁶ *9* α(N)=7.26×10⁻⁷ *11*; α(O)=4.76×10⁻⁸ *7*; α(IPF)=1.25×10⁻⁵ *16* A_2=+0.15 *4*, A_4=−0.10 *4*. Pol=+0.15 *19*.
1295.5[e] *3*	5[ec] *4*	2168.8	(1/2⁺)	873.29	3/2⁻				
1295.5[e] *3*	10[ec] *3*	3035.5		1740.0	13/2⁺				
1321.6 *7*	14.1 *6*	2550.0	(7/2)⁺	1228.36	5/2⁺	M1+E2		3.43×10⁻⁴ *6*	α(K)=0.000278 *4*; α(L)=2.99×10⁻⁵ *5*; α(M)=5.02×10⁻⁶ *7* α(N)=6.32×10⁻⁷ *9*; α(O)=4.15×10⁻⁸ *7*; α(IPF)=2.9×10⁻⁵ *4* A_2=−0.166 *22*, A_4=0.007 *27*. Pol=+0.07 *12*.
1546.7[&] *10*	8 *3*	2420.4	(5/2)⁻	873.29	3/2⁻				
1739.8 *4*	165 *5*	1740.0	13/2⁺	0.0	9/2⁺	E2		3.67×10⁻⁴	α(K)=0.0001605 *23*; α(L)=1.718×10⁻⁵ *24*; α(M)=2.88×10⁻⁶ *4* α(N)=3.63×10⁻⁷ *5*; α(O)=2.38×10⁻⁸ *4*; α(IPF)=0.000186 *3* A_2=+0.369 *19*, A_4=−0.095 *23*. Pol=+0.62 *5*. δ: δ(M3/E2)=+0.02 *3*.
1770.4 *5*	32.5 *10*	1770.7	5/2⁺	0.0	9/2⁺	E2		3.75×10⁻⁴	α(K)=0.0001552 *22*; α(L)=1.661×10⁻⁵ *24*; α(M)=2.79×10⁻⁶ *4* α(N)=3.51×10⁻⁷ *5*; α(O)=2.31×10⁻⁸ *4*; α(IPF)=0.000200 *3* A_2=+0.059 *16*, A_4=−0.033 *20*. Pol=+0.10 *18*.
1919.4 *6*	44.5 *13*	1919.9	7/2⁺	0.0	9/2⁺	M1+E2	+0.70 *5*	3.96×10⁻⁴	α(K)=0.0001344 *19*; α(L)=1.433×10⁻⁵ *20*; α(M)=2.40×10⁻⁶ *4* α(N)=3.03×10⁻⁷ *5*; α(O)=2.00×10⁻⁸ *3*; α(IPF)=0.000244 *4* A_2=−0.537 *14*, A_4=0.003 *16*. Pol=+0.07 *7*.
2026.2[b] *10*	≈3	2414.7	3/2⁻	388.54	1/2⁻				
2153.5 *7*	46 *2*	2153.5	(11/2)⁺	0.0	9/2⁺	M1+E2	−0.80 *10*	4.78×10⁻⁴ *8*	α(K)=0.0001086 *16*; α(L)=1.156×10⁻⁵ *17*; α(M)=1.94×10⁻⁶ *3* α(N)=2.44×10⁻⁷ *4*; α(O)=1.617×10⁻⁸ *23*; α(IPF)=0.000355 *6* A_2=−0.907 *18*, A_4=0.110 *20*. Pol=+0.20 *6*.

From ENSDF

$^{87}_{38}$Sr$_{49}$-5

γ(^{87}Sr) (continued)

E_γ †	I_γ ‡	E_i(level)	J_i^π	E_f	J_f^π	Mult. #	δ #	α d	Comments
2235.7 *10*	30.7 *9*	2235.7	9/2$^+$	0.0	9/2$^+$	E2(+M1)	>4	5.35×10^{-4}	α(K)=0.0001012 *15*; α(L)=1.077×10^{-5} *16*; α(M)=1.81×10^{-6} *3* α(N)=2.28×10^{-7} *4*; α(O)=1.502×10^{-8} *21*; α(IPF)=0.000421 *6* A_2=−0.142 *20*, A_4=−0.085 *24*. Pol=−0.35 *14*.
2536.7 *7*	30.6 *12*	2536.3	11/2$^-$	0.0	9/2$^+$	E1+M2	−0.18 *+13−22*	0.00101 *6*	α(K)=5.1×10^{-5} *10*; α(L)=5.4×10^{-6} *11*; α(M)=9.0×10^{-7} *18* α(N)=1.14×10^{-7} *23*; α(O)=7.5×10^{-9} *15*; α(IPF)=0.00095 *8* A_2=−0.28 *3*, A_4=0.02 *3*. Pol=+0.13 *12*.
2555.0 *7*	22.5 *9*	2555.0	(9/2)$^-$	0.0	9/2$^+$	E1		1.04×10^{-3}	α(K)=4.75×10^{-5} *7*; α(L)=5.02×10^{-6} *7*; α(M)=8.41×10^{-7} *12* α(N)=1.059×10^{-7} *15*; α(O)=7.01×10^{-9} *10*; α(IPF)=0.000986 *14* A_2=+0.39 *4*, A_4=−0.04 *5*. Pol=−0.47 *20*. δ: δ(M2/E1)=+0.03 *3*.
2704.3@ *20*		2704.3?		0.0	9/2$^+$				
2920.7 *12*		2920.8	7/2$^+$,9/2$^+$	0.0	9/2$^+$				
3154.9& *15*		3155.0		0.0	9/2$^+$				

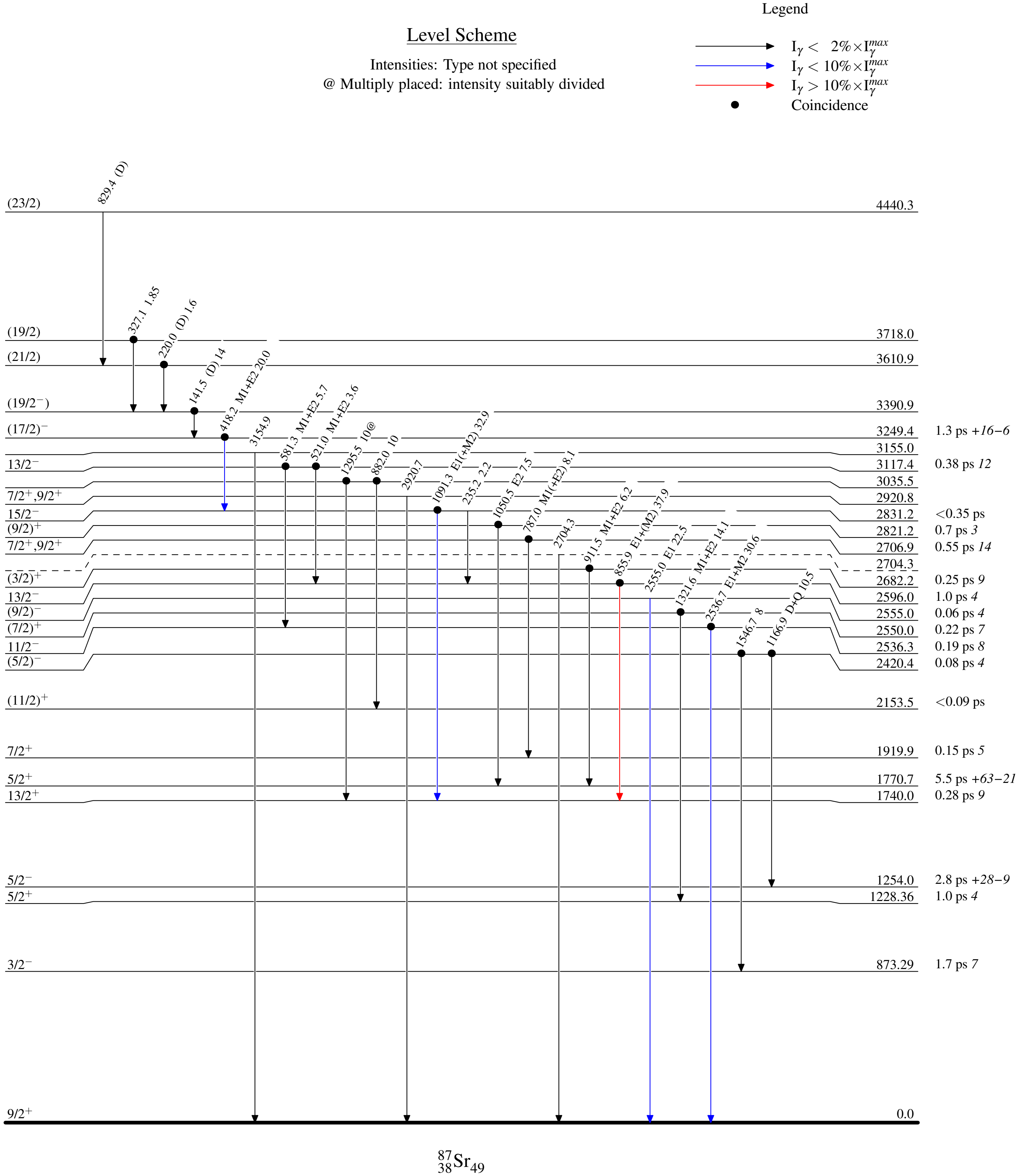
† Weighted average from 1981Ek01 and 1975Ar06, unless indicated otherwise.
‡ From 1981Ek01, measured at E_α=14 MeV, unless indicated otherwise; other: 1975Ar06 values given without uncertainties.
# From γ angular distribution and γ linear polarization at 90° (1981Ek01), unless noted otherwise.
@ From 1975Ar06 only.
& From 1981Ek01 only.
a From γ angular distribution at E_α=14 MeV in ^{84}Kr(α,nγ) and A_2 at E_α=31 MeV in ^{86}Kr(α,3nγ) (1975Ar06).
b Used from 1977Ba61 by 1981Ek01 for internal calibration lines.
c The authors′ statement that the Iγ ratio from the 3035 and 2169 levels is approximately 1:2 appears to be a misprint. From their level scheme, and Iγ=15 *2* for the doublet, one gets Iγ=10 *+7−5* for placement from the 3035 level, and 5 *−5+7* for placement from the 2168 level.
d Additional information 1.
e Multiply placed with intensity suitably divided.
x γ ray not placed in level scheme.

^{86}Kr(α,3nγ), ^{84}Kr(α,nγ) 1981Ek01,1975Ar06

Level Scheme

Intensities: Type not specified

@ Multiply placed: intensity suitably divided

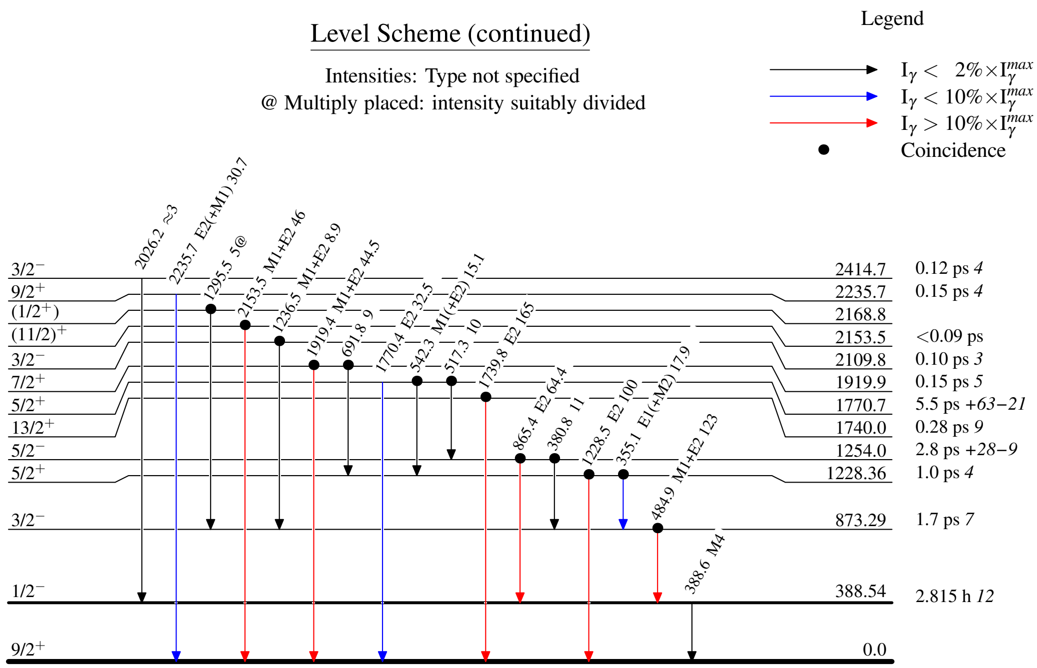


^{86}Kr(α,3nγ), ^{84}Kr(α,nγ) 1981Ek01,1975Ar06

Level Scheme (continued)

Intensities: Type not specified

@ Multiply placed: intensity suitably divided



$^{87}_{38}Sr_{49}$