^{82}Se(α,2nγ) 1990Ro10,2006Sc22

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	J. K. Tuli, A. Luca, S. Juutinen, and B. Singh	NDS 110,2815 (2009)	30-Sep-2009

E=12-27 MeV. Enriched target. Measured: γ, ce, $\gamma(\theta)$, $\gamma(\theta$,H,t), $\gamma\gamma$, γ(t), $\gamma\gamma$(t), γ linear polarization, excit. Deduced α(K)exp, assuming α(K)exp(882γ,E2)=5.9×10^{-4} (theory). HPGE, FWHM=0.9 at 60 keV, 1.9 at 1300 keV.

1985Ro22: preliminary report superseded by 1990Ro10.

2006Sc22: E=24 MeV. Target=layer of enriched ^{82}Se on the top of a layer. The Cd layer served as implantation host where recoil ^{84}Kr were stopped. Measured quadrupole moment of yrast 8$^+$ state by level-mixing.

Other (α,2nγ) studies:

1982Za04: E=16.5 MeV to 27.3 MeV. Enriched target. Ge(Li), NaI(Tl). Measured Eγ, Iγ, $\gamma\gamma$, α,γ(t), time-differential perturbed angular distributions.

1971Mc12: E=25 MeV. Enriched target. FWHM=3.0 keV at 1.33 MeV. Measured Eγ, Iγ, $\gamma(\theta)$, γ(t).

1973Wy01, 1971WyZW: E=25 MeV. Enriched target. Si(Li), FWHM=2.5 keV at 700 keV. Measured conversion electron spectra.

^{84}Kr Levels

E(level)[†]	J$^\pi$	T$_{1/2}$	Comments
0.0[a]	0$^+$		
881.61[a] *10*	2$^+$	3.2[‡] ps *14*	
1831.61 *23*	0$^+$	25[‡] ps *10*	
1897.82[b] *18*	2$^+$	0.30[#] ps *+7−3*	
2095.08[a] *13*	4$^+$	0.45[#] ps *+5−7*	
2345.45[b] *13*	4$^+$	24[‡] ps *3*	
2622.93 *23*	2$^+$	0.28[#] ps *14*	
2700.2 *3*	3$^-$	1.7[#] ps *+14−11*	
2770.66[c] *15*	5$^-$	7.6[‡] ps *21*	J$^\pi$: possible configuration=((ν g$_{9/2}$)$^{-1}$(ν p$_{1/2}$)$^{-1}$).
3042.6 *3*	(2$^+$,3,4$^+$)		
3172.66[a] *15*	6$^+$	2.6[‡] ps *7*	
3219.59[d] *15*	5$^-$	17[‡] ps *4*	J$^\pi$: possible configuration=((π f$_{5/2}$)$^{-1}$(π g$_{9/2}$)) or configuration=((π p$_{3/2}$)$^{-1}$(π g$_{9/2}$)).
3236.17[a] *18*	8$^+$	1.89[@] μs *4*	g=−0.247 *2* (1982Za04) Q=0.36 *4* (2006Sc22) Q: From level-mixing spectroscopy (lems) technique (2006Sc22) using Q(^{79}Kr, 5/2$^-$)=0.456 *26* as reference value. J$^\pi$: configuration=(ν g$_{9/2}$)$^{-2}$. T$_{1/2}$: Authors give av of their value 1.93 μs *4* and 1.84 μs *4* (1982Za04).
3288.69 *17*	5$^+$	0.31[#] ps *10*	
3587.21[d] *16*	6$^-$	5.5[‡] ps *14*	
3638.69 *25*	(5$^-$)	0.69[#] ps *+28−21*	
3651.62[c] *20*	7$^-$		
3831.72[d] *16*	7$^-$	4.9[‡] ps *21*	
3951.29[b] *19*	6$^+$	0.9[#] ps *5*	
3999.3 *4*	(4$^-$)	0.35[#] ps *10*	
4350.2 *3*	(5$^-$)	0.28[#] ps *+14−7*	
4388.30[d] *22*	8$^-$	6.7[‡] ps *17*	
4407.5 *5*	(6$^-$)	0.31[#] ps *14*	
4718.63[b] *19*	8$^+$	5.5[‡] ps *21*	
4852.30[c] *22*	9$^-$	0.83[#] ps *35*	
4929.08[d] *24*	(9$^-$)	0.55[#] ps *21*	

Continued on next page (footnotes at end of table)

^{82}Se(α,2nγ) 1990Ro10,2006Sc22 (continued)

^{84}Kr Levels (continued)

E(level)[†]	J$^{\pi}$	$T_{1/2}$	Comments
4976 *1*	(9$^+$)		
5204.19[a] *25*	10$^+$	0.14[#] ps *4*	
5373.5[a] *3*	12$^+$	43.7[&] ns *21*	g=+0.17 *2* (1990Ro10) J$^{\pi}$: configuration=((π $f_{5/2}$)$^{-1}$(π $p_{3/2}$)$^{-1}$(ν $g_{9/2}$)$^{-2}$). g: average value given by 1990Ro10 from their measurement of +0.175 *15* and their earlier (1985Ro22) measurement of +0.14 *3*.
5448.83[b] *21*	10$^+$	3.5[‡] ps *14*	
5640.8[d] *3*	(10$^-$)	0.49[#] ps *21*	
5901.7[c] *3*	11$^-$	1.9[#] ps *6*	
6068 *1*			
6472.3 *4*			
6572.1 *3*	(12)$^-$	0.42[#] ps *14*	
6590.3 *6*			
7015.8 *4*	(13)$^-$	0.17[#] ps *7*	
7653.2 *5*	(14$^-$)	0.28[#] ps *7*	

[†] From least-squares fit to Eγ.
[‡] From recoil-distance technique.
[#] From Doppler-shift attenuation technique.
[@] From external beam pulsing.
[&] From γ(t).
[a] Band(A): π=+ sequence-1.
[b] Band(B): π=+ sequence-2.
[c] Band(C): π=− ΔJ=2 sequence.
[d] Band(D): π=− ΔJ=1 sequence.

γ(^{84}Kr)

Eγ	Iγ‡	Ei(level)	J^π_i	E_f	J^π_f	Mult.#	δ@	α†	Comments
63.5 *1*	44 *7*	3236.17	8+	3172.66	6+	E2		4.89	α(K)exp=7 *2* α(K)=3.98 *6*; α(L)=0.779 *13*; α(M)=0.1262 *20*; α(N+..)=0.01078 *17* α(N)=0.01078 *17* Mult.: E2 or M2 from α(K)exp but M2 ruled out by $T_{1/2}$ consideration.
169.3 *1*	100 *13*	5373.5	12+	5204.19	10+	E2		0.1324	α(K)exp=0.088 *30* α(K)=0.1153 *17*; α(L)=0.01455 *21*; α(M)=0.00235 *4*; α(N+..)=0.000223 *4* α(N)=0.000223 *4*
x179.0 *5*	4& *1*								
180.1 *2*	20 *3*	3831.72	7−	3651.62	7−	M1+E2	−0.12 *8*	0.0277 *20*	α(K)=0.0245 *17*; α(L)=0.00272 *22*; α(M)=0.00044 *4*; α(N+..)=4.4×10−5 *4* α(N)=4.4×10−5 *4*
244.5 *1*	33 *3*	3831.72	7−	3587.21	6−	M1+E2	+0.07 *3*	0.01225 *21*	α(K)exp=0.012 *2* α(K)=0.01085 *19*; α(L)=0.001186 *21*; α(M)=0.000192 *4*; α(N+..)=1.94×10−5 *4* α(N)=1.94×10−5 *4*
298.5 *1*	9 *1*	3587.21	6−	3288.69	5+	E1		0.00375 *6*	α=0.00375 *6*; α(K)=0.00333 *5*; α(L)=0.000355 *5*; α(M)=5.73×10−5 *8*; α(N+..)=5.74×10−6 *8* α(N)=5.74×10−6 *8*
367.6 *1*	77 *8*	3587.21	6−	3219.59	5−	M1+E2	+0.24 *6*	0.00466 *14*	α(K)exp=0.0041 *4* α=0.00466 *14*; α(K)=0.00413 *12*; α(L)=0.000448 *14*; α(M)=7.25×10−5 *22*; α(N+..)=7.30×10−6 *22* α(N)=7.30×10−6 *22*
419.0 *3*	3 *1*	3638.69	(5−)	3219.59	5−				
425.2 *1*	240 *20*	2770.66	5−	2345.45	4+	E1		0.001458 *21*	α(K)exp=0.0015 *2* α=0.001458 *21*; α(K)=0.001296 *19*; α(L)=0.0001377 *20*; α(M)=2.22×10−5 *4*; α(N+..)=2.24×10−6 α(N)=2.24×10−6 *4*
443.7 *2*	25 *7*	7015.8	(13)−	6572.1	(12)−	M1		0.00283 *4*	α=0.00283 *4*; α(K)=0.00251 *4*; α(L)=0.000270 *4*; α(M)=4.37×10−5 *7*; α(N+..)=4.42×10−6 *7* α(N)=4.42×10−6 *7*
447.6 *3*	12 *3*	2345.45	4+	1897.82	2+				
448.9 *1*	55 *7*	3219.59	5−	2770.66	5−	M1		0.00275 *4*	α=0.00275 *4*; α(K)=0.00244 *4*; α(L)=0.000263 *4*; α(M)=4.25×10−5 *6*; α(N+..)=4.30×10−6 *6* α(N)=4.30×10−6 *6*
519b *1*	≈3&	3219.59	5−	2700.2	3−				
540.7 *2*	15 *5*	4929.08	(9−)	4388.30	8−	D+Q	+0.18 *5*		
556.6 *2*	50 *6*	4388.30	8−	3831.72	7−	M1+E2	+0.17 *4*	0.00169 *3*	α(K)exp=0.0016 *2* α=0.00169 *3*; α(K)=0.001501 *23*; α(L)=0.0001606 *25*; α(M)=2.60×10−5 *4*; α(N+..)=2.63×10−6 *4* α(N)=2.63×10−6 *4*

$^{84}_{36}$Kr$_{48}$-3

γ(^{84}Kr) (continued)

E_γ	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	δ[@]	α[†]	Comments
605.1 4	6 3	2700.2	3⁻	2095.08	4⁺				
612.1 2	64 9	3831.72	7⁻	3219.59	5⁻	E2		0.001760 25	α(K)exp=0.0018 2 α=0.001760 25; α(K)=0.001559 22; α(L)=0.0001704 24; α(M)=2.76×10^{-5} 4; α(N+..)=2.75×10^{-6} α(N)=2.75×10^{-6} 4
637.4 3	13 4	7653.2	(14⁻)	7015.8	(13)⁻	D			
659.1 2	40 6	3831.72	7⁻	3172.66	6⁺	E1			
662.6 3	≈10[&]	3951.29	6⁺	3288.69	5⁺				
670.4 2	11 4	6572.1	(12)⁻	5901.7	11⁻				
694 1	≈25[&]	6068		5373.5	12⁺				
711.6 2	9 3	5640.8	(10⁻)	4929.08	(9⁻)				
730.2 1	38 6	5448.83	10⁺	4718.63	8⁺	E2		0.001084 16	α=0.001084 16; α(K)=0.000962 14; α(L)=0.0001041 15; α(M)=1.685×10^{-5} 24 α(N)=1.689×10^{-6} 24
763.0 2	11 3	4350.2	(5⁻)	3587.21	6⁻				
767.3 2	19 3	4718.63	8⁺	3951.29	6⁺	Q			
801.1 3	23 7	4388.30	8⁻	3587.21	6⁻	E2			
802.4 3	15 5	2700.2	3⁻	1897.82	2⁺	E1			
816.6 2	8 2	3587.21	6⁻	2770.66	5⁻				
881.0 3	110[&] 30	3651.62	7⁻	2770.66	5⁻	E2			I_γ: from Iγ/Iγ(881.6)=0.11 3. E_γ: from E(level) difference.
881.6 1	1000	881.61	2⁺	0.0	0⁺	[E2]			
886.9 2	20 3	4718.63	8⁺	3831.72	7⁻	E1			
943.2 2	30 5	3288.69	5⁺	2345.45	4⁺	M1+E2	+0.4 1		
947.6 3	9 3	3042.6	(2⁺,3,4⁺)	2095.08	4⁺				
950.0 2	21[a] 2	1831.61	0⁺	881.61	2⁺				
1016.2 3	15 3	1897.82	2⁺	881.61	2⁺	D+Q	+0.16 8		
1049.4 2	24 5	5901.7	11⁻	4852.30	9⁻	E2			
1077.6 1	450 30	3172.66	6⁺	2095.08	4⁺	E2			α(K)exp=0.0004 1
1097.3 3	≈20[&]	4929.08	(9⁻)	3831.72	7⁻				
[x]1114 1	≈15[&]								
1124.5 2	105 15	3219.59	5⁻	2095.08	4⁺	E1			
1141.5 5	≈8[&]	6590.3		5448.83	10⁺				
1198.6 2	24 5	6572.1	(12)⁻	5373.5	12⁺	E1			
1200.7 2	43 8	4852.30	9⁻	3651.62	7⁻	E2			
1213.5 1	645 30	2095.08	4⁺	881.61	2⁺	E2			
1228.6 3	10 3	3999.3	(4⁻)	2770.66	5⁻				
1252.6 2	11 3	5640.8	(10⁻)	4388.30	8⁻				
1268.1 3	≈7[&]	6472.3		5204.19	10⁺				
1463.8 1	315 20	2345.45	4⁺	881.61	2⁺	E2			
1543.7 3	3 1	3638.69	(5⁻)	2095.08	4⁺				

γ(^{84}Kr) (continued)

E_γ	I_γ‡	E_i(level)	J_i^π	E_f	J_f^π	Mult.#	δ@
1546.0 *2*	20 *4*	4718.63	8^+	3172.66	6^+	Q	
1605.7 *3*	7 *3*	3951.29	6^+	2345.45	4^+		
1616.1 *2*	18 *5*	4852.30	9^-	3236.17	8^+	D	
1636.8 *4*	≈3&	4407.5	(6^-)	2770.66	5^-		
1740 *1*	≈70&	4976	(9^+)	3236.17	8^+		
1741.3 *2*	6.0[a] *3*	2622.93	2^+	881.61	2^+	D+Q	−1.5 *+5−10*
1856.2 *3*	15 *4*	3951.29	6^+	2095.08	4^+	Q	
1897.8 *3*	35 *4*	1897.82	2^+	0.0	0^+	E2	
1968.0 *2*	170 *20*	5204.19	10^+	3236.17	8^+	E2	
2160.8 *6*	8 *3*	3042.6	$(2^+,3,4^+)$	881.61	2^+		

† Additional information 1.

‡ At E(α)=27 MeV.

\# From linear polarization and α(K) measurements. The α(K) are normalized to 0.00059 (E2, theory) for the 881γ.

@ From $\gamma(\theta)$.

& Estimated from coin measurement.

[a] Determined at E(α)=12 MeV.

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

[x] γ ray not placed in level scheme.

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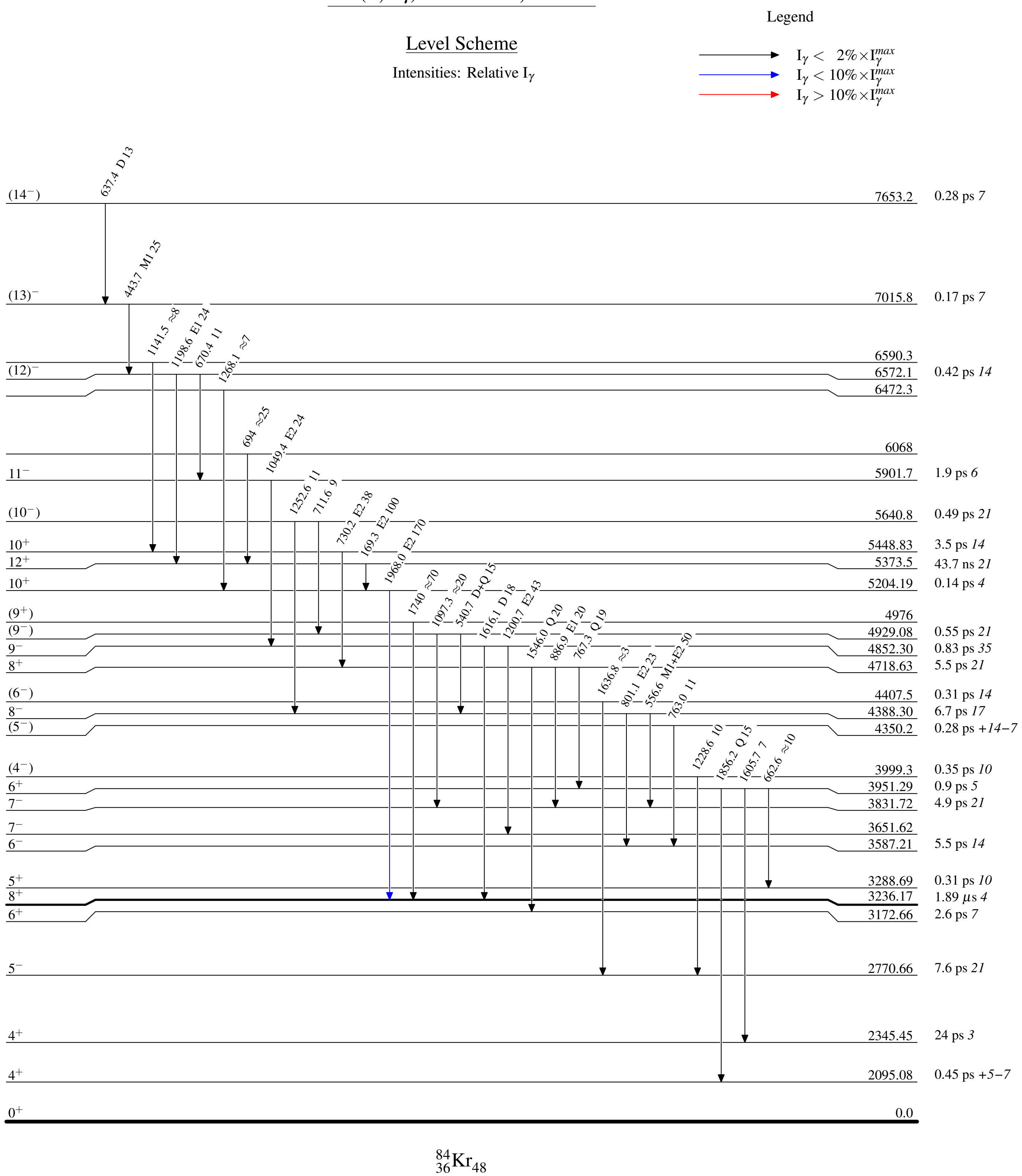
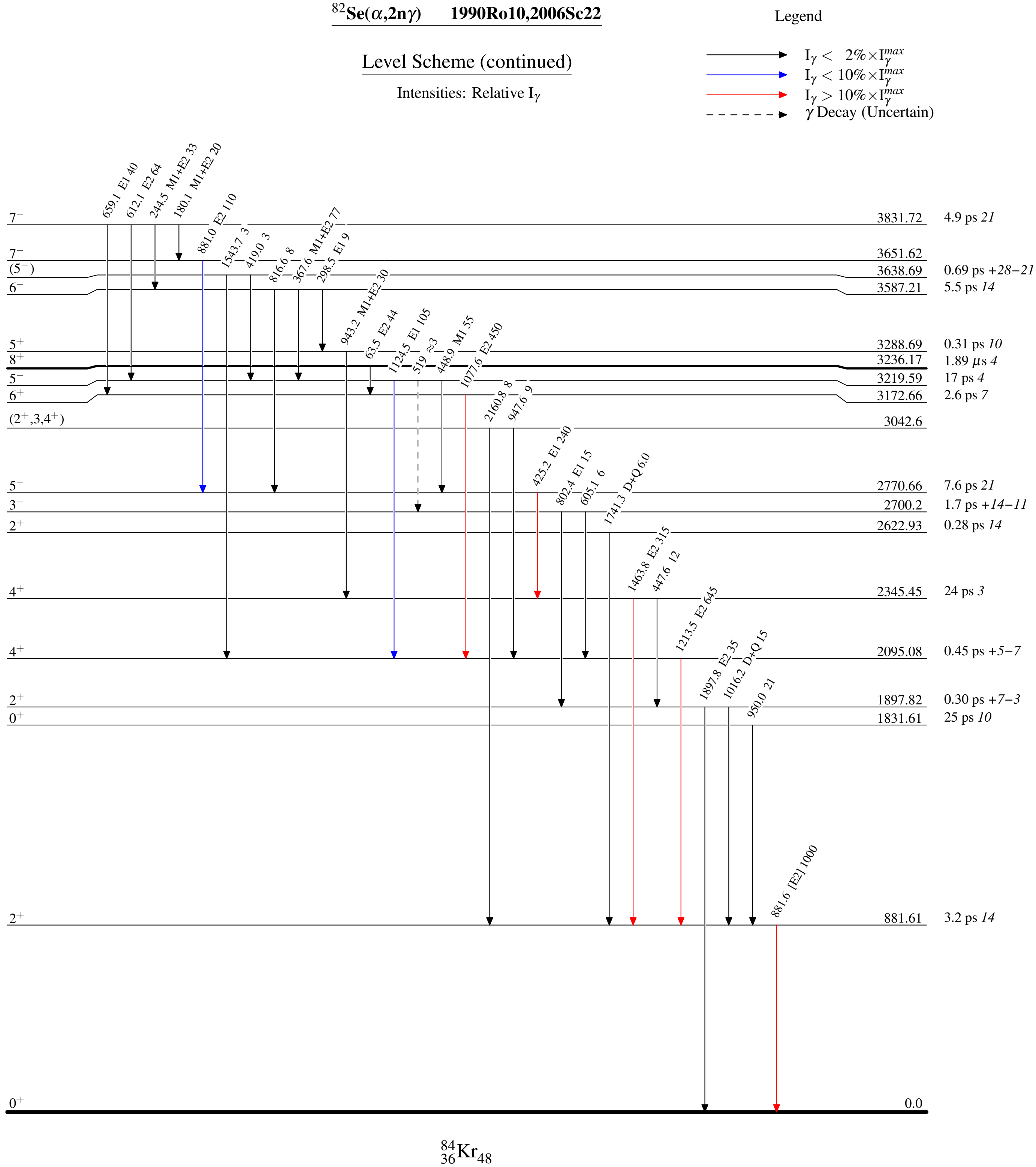


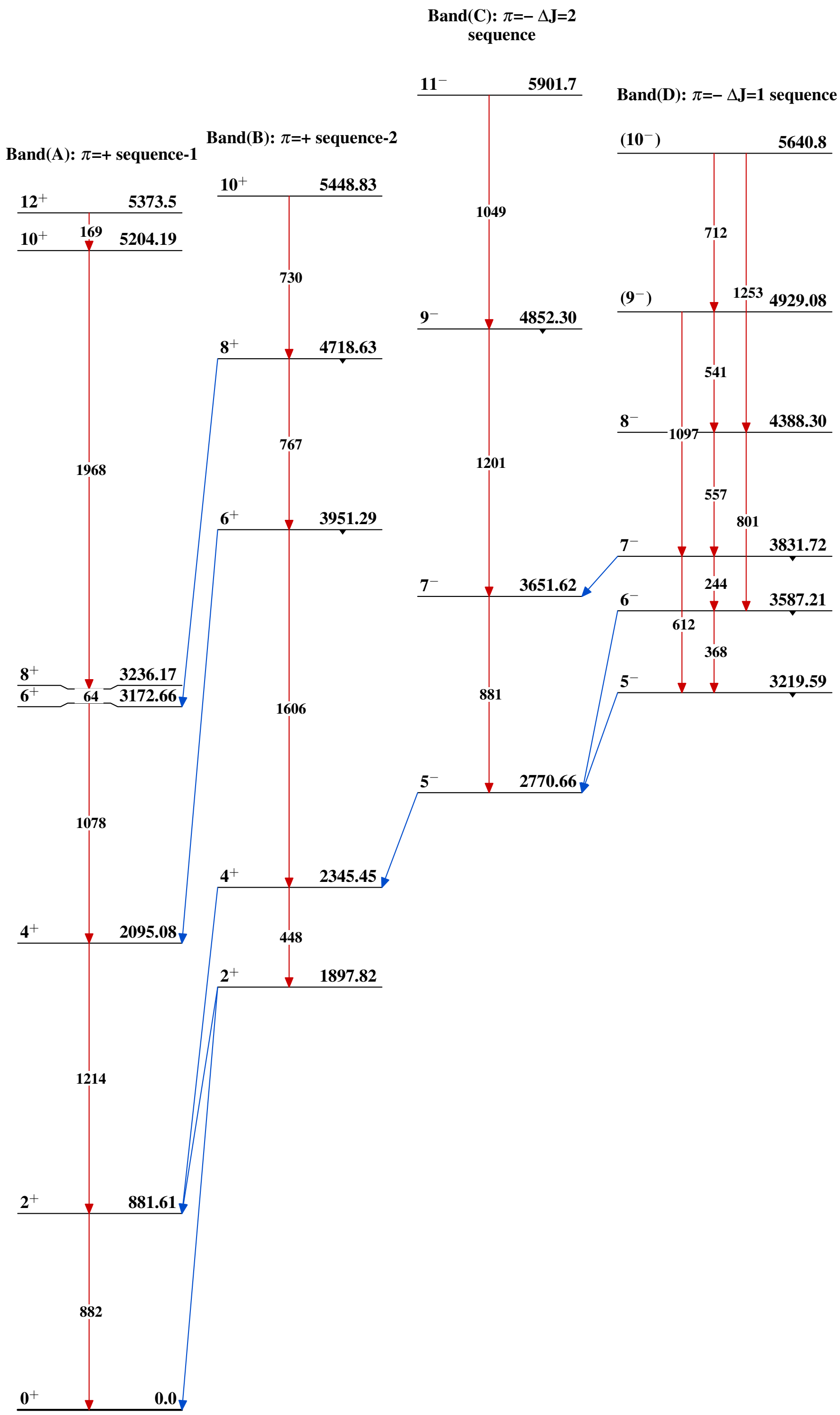
^{82}Se(α,2nγ) 1990Ro10,2006Sc22

Level Scheme (continued)

Intensities: Relative I_γ



^{82}Se(α,2nγ) 1990Ro10,2006Sc22



$^{84}_{36}Kr_{48}$