^{80}Se(n,n′γ) 1999Ko46,1989Do14,1977SiZT

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	NDS 105, 223 (2005)	22-Jun-2005

1999Ko46: E=fast neutrons from a reactor. Measured Eγ, Iγ, γ(θ), γγ, lifetimes by DSAM, Hauser-Feshbach-Moldauer (HFM) analysis. See also 1996Ko41 from the same group.

1989Do14, 1986ChZI (also 1988DoZS,1987KaZR): fast neutrons from a reactor, measured γ, γ(θ), $T_{1/2}$(level) by DSA method.

1977SiZT (also 1975SiZT,1975SiZX): E=2.0-4.1 MeV. Measured γ. Authors mention γγ and γ(θ) measurements also but no details are available. Relative γ intensities are given at E(n)=2.0, 2.2, 2.5, 2.7, 2.9, 3.1, 3.3, 3.5, 3.7, 3.9 and 4.1 MeV.

Others:

1975Ef01, 1972Ko17: E=600-2000 keV. Measured σ for 666 level.

1971Br18: E=14.4 MeV. Measured σ.

Additional information 1.

1961Ni03: E=3.1-4.7 MeV. Measured γ and cross sections.

1960An14: E=3 MeV, measured γ.

1959Ma05: E=1.0-2.7 MeV. Measured γ.

A 2787 level with 1307.9γ from this level proposed earlier (1989Do14,1986ChZI) has been omitted since not confirmed by 1999Ko46.

^{80}Se Levels

E(level)‡	Jπ†	$T_{1/2}$#	Comments
0.0	0^+		
666.28 *6*	2^+		
1449.39 *7*	2^+	0.8 ps *+24−3*	
1478.76 *11*	0^+		
1701.45 *11*	4^+	0.7 ps *+10−4*	
1873.41 *12*	(0^+)		Jπ: from HFM analysis (1999Ko46).
1959.82 *8*	2^+	0.38 ps *+22−12*	$T_{1/2}$: average of 0.35 ps *+21−11* and 0.42 ps *+24−14* (1999Ko46).
2121.15 *14*	(3^+)		Jπ: from HFM analysis (1999Ko46).
2311.31 *9*	(2^+)	0.152 ps *+28−14*	Jπ: from HFM analysis (1999Ko46). $T_{1/2}$: other: 0.18 ps *+5−3* (1989Do14,1987KaZR).
2344.19 *9*	(1^+)	0.35 ps *+17−10*	Jπ: from HFM analysis (1999Ko46); $(1^+,2^+)$ in 'Adopted Levels'. $T_{1/2}$: other: 0.19 ps *+9−4* (1989Do14,1987KaZR).
2494.78 *23*	(4^+)	1.1 ps *7*	$T_{1/2}$: Other: 0.8 ps *+10−4* (1989Do14). It should be noted that ($T_{1/2}$=0.035 ps *+35−21*) was reported (1987KaZR) in an earlier communication by the authors of 1989Do14.
2513.55 *10*	(2^+)	0.048 ps *7*	Jπ: from HFM analysis (1999Ko46). $T_{1/2}$: other: 0.083 ps *+28−21* (1989Do14,1987KaZR).
2627.60 *22*	(0^+)		Jπ: from HFM analysis (1999Ko46).
2716.66 *11*	3^-	0.38 ps *14*	$T_{1/2}$: other: 0.33 ps *+19−9* (1989Do14,1987KaZR).
2814.55 *17*	(1^+)		Jπ: from HFM analysis (1999Ko46); $(1^+,2^+)$ in 'Adopted Levels'.
2825.56 *23*	(6^+)		Jπ: from HFM analysis (1999Ko46).
2827.01 *11*	(2^+)	0.18 ps *4*	$T_{1/2}$: other: 0.09 ps *+5−2* (1989Do14,1987KaZR).
2947.56 *15*	(4^+)	0.18 ps *+11−6*	Jπ: from HFM analysis (1999Ko46); $(2^+,4^+)$ in 'Adopted Levels'.
3025.19 *16*	(1^+)	0.049 ps *14*	Jπ: from HFM analysis (1999Ko46); $(1^+,2^+)$ in 'Adopted Levels'. $T_{1/2}$: other: 0.021 ps *14* (1989Do14,1987KaZR). Additional information 2.
3037.74 *13*	(1^+)	0.13 ps *+9−5*	Jπ: from HFM analysis (1999Ko46); $(1^+,2^+)$ in 'Adopted Levels'.
3125.62 *21*	(0^+)	0.028 ps *14*	Jπ: from HFM analysis (1999Ko46); (2^+) in 'Adopted Levels'. $T_{1/2}$: from 1989Do14; not measured by 1999Ko46.
3176.92 *19*	$(1,2^+)$		
3199.6@ *5*	(2)		
3224.27 *19*	(1,2)	0.070 ps *28*	
3280.5@ *4*	$(1,2^+)$		
3348.5@ *5*	(1^+)		

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^{80}Se(n,n′γ) 1999Ko46,1989Do14,1977SiZT (continued)

^{80}Se Levels (continued)

E(level)‡	Jπ†	Comments
3442.1 *3*	(0+)	Jπ: from HFM analysis (1999Ko46).
3813.7 *4*	(6+)	Jπ: from HFM analysis (1999Ko46).
3814.9 *5*	(8+)	
4047.1@ *5*	(2+)	
4436.6 *4*	(5−)	Jπ: from HFM analysis (1999Ko46).

† From 'Adopted Levels', unless otherwise stated.
‡ From least-squares fit to Eγ's.
# DSA method (1999Ko46,1989Do14). Values are from 1999Ko46, unless otherwise stated.
@ Level from 1977SiZT only.

γ(^{80}Se)

A_2 and A_4 coefficients are from γ(θ) data of 1989Do14.

Eγ†	Iγ†	Ei(level)	J_i^π	E_f	J_f^π	Mult.‡	δ‡	Comments
405.1 *3*	0.10 *3*	2716.66	3−	2311.31	(2+)			
470.5 *4*	0.6 *1*	2344.19	(1+)	1873.41	(0+)			
666.2 *1*	100 *5*	666.28	2+	0.0	0+			Additional information 3.
671.7 *2*	0.6 *1*	2121.15	(3+)	1449.39	2+			
783.1 *1*	6.8 *1*	1449.39	2+	666.28	2+	M1+E2		Additional information 4. δ: from A_2=−0.04 *7*, A_4=−0.06 *9*; δ=+5 *+3−2* or −0.15 *+9−5* (1989Do14,1988DoZS). But in the evaluator's estimate, δ=−0.4 *1* or >+8. Both these sets of values are in disagreement with −5 *+2−6* or −0.71 *+12−17* from Coul. ex.
793.0 *3*	1.0 *3*	2494.78	(4+)	1701.45	4+	M1+E2	+1.1 *1*	Additional information 16. Mult.,δ: from A_2=+0.31 *6*, A_4=−0.16 *8*.
812.4 *1*	4.6 *1*	1478.76	0+	666.28	2+			Additional information 6.
826.4 *2*	0.15 *5*	2947.56	(4+)	2121.15	(3+)			
861.9 *1*	0.5 *1*	2311.31	(2+)	1449.39	2+			Additional information 11.
894.8 *1*	1.1 *1*	2344.19	(1+)	1449.39	2+			Additional information 13.
989.3 *4*	<0.02	3814.9	(8+)	2825.56	(6+)			
1015.1 *2*	0.10 *2*	2716.66	3−	1701.45	4+			
1035.1 *1*	7.9 *3*	1701.45	4+	666.28	2+	E2		Additional information 7. A_2=+0.32 *7*, A_4=−0.15 *7*.
1046@		2494.78	(4+)	1449.39	2+			Eγ: from 1986ChZI. Iγ=0.10 *2* (1986ChZI),≈0.03 (1977SiZT). γ not reported by 1999Ko46; uncertain In 1977SiZT.
1063.8 *4*	0.10 *3*	2513.55	(2+)	1449.39	2+			Additional information 18.
1078.6 *2*	0.25 *5*	3037.74	(1+)	1959.82	2+			Eγ: level-energy difference=1077.9. Additional information 31.
1097# *1*		3442.1	(0+)	2344.19	(1+)			Iγ: 0.8 *2* (1977SiZT).
1124.1 *2*	0.24 *3*	2825.56	(6+)	1701.45	4+			Additional information 24.
1178.2 *2*	0.4 *1*	2627.60	(0+)	1449.39	2+			Additional information 21.
1207.1 *1*	2.7 *2*	1873.41	(0+)	666.28	2+			Additional information 8.
1293.6 *1*	3.8 *2*	1959.82	2+	666.28	2+	M1+E2		Additional information 9. δ: −0.31 *5* or +10 *+10−2* (1989Do14,1988DoZS) from A_2=+0.03 *7*, A_4=0.00 *9*.

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^{80}Se(n,n′γ) 1999Ko46,1989Do14,1977SiZT (continued)

γ(^{80}Se) (continued)

E_γ †	I_γ †	E_i(level)	J_i^π	E_f	J_f^π	Mult. ‡	Comments
1449.4 *1*	10.2 *3*	1449.39	2^+	0.0	0^+		Additional information 5. A_2=+0.28 *10*, A_4=0.00.
1454.9 *2*	3.9 *3*	2121.15	(3^+)	666.28	2^+		
1498.1 *2*	0.3 *1*	2947.56	(4^+)	1449.39	2^+		Additional information 27.
1522.8 *2*	0.23 *3*	3224.27	(1,2)	1701.45	4^+		Additional information 36.
1558.7 *2*	0.20 *5*	3037.74	(1^+)	1478.76	0^+		Additional information 32.
1577.6 *3*	0.10 *3*	3025.19	(1^+)	1449.39	2^+		E_γ: poor fit; level-energy difference=1575.8. Additional information 29.
1587.9 *2*	0.14 *3*	3037.74	(1^+)	1449.39	2^+		Additional information 33.
1645.0 *1*	2.5 *3*	2311.31	(2^+)	666.28	2^+	D+Q	Additional information 12. δ: −0.09 +*2*−*6* or +1.95 *7* from A_2=+0.34 *6*, A_4=+0.07 *7*. $I\gamma(1645\gamma)/I\gamma(862\gamma)$ is low by a factor of ≈2 as compared to that from ^{80}As β^- decay.
1677.0#@ *5*		3125.62	(0^+)	1449.39	2^+		I_γ: ≈0.02 (1977SiZT).
1677.9 *1*	0.6 *1*	2344.19	(1^+)	666.28	2^+		Additional information 14.
1697.8 *5*	0.07 *2*	3176.92	$(1,2^+)$	1478.76	0^+		
1745.5 *3*	0.10 *5*	3224.27	(1,2)	1478.76	0^+		Additional information 37.
1828.8 *3*	0.53 *5*	2494.78	(4^+)	666.28	2^+		Additional information 17.
1847.3 *1*	2.3 *2*	2513.55	(2^+)	666.28	2^+		Additional information 19.
1941.8 *3*	0.05 *2*	4436.6	(5^-)	2494.78	(4^+)		Additional information 40. E_γ: 1977SiZT placed a 1942.0γ from 3813 level.
1959.9 *1*	2.1 *2*	1959.82	2^+	0.0	0^+		Additional information 10.
2050.4 *1*	1.3 *1*	2716.66	3^-	666.28	2^+		Additional information 22.
2112.2 *3*	0.08 *3*	3813.7	(6^+)	1701.45	4^+		Additional information 39.
2148.0 *3*	0.2 *1*	2814.55	(1^+)	666.28	2^+		
2160.7 *1*	1.3 *2*	2827.01	(2^+)	666.28	2^+		Additional information 25.
2281.4 *3*	0.2 *1*	2947.56	(4^+)	666.28	2^+		Additional information 28.
2344 *1*	0.10 *2*	2344.19	(1^+)	0.0	0^+		Additional information 15.
2358.2 *2*	0.20 *5*	3025.19	(1^+)	666.28	2^+		E_γ: level-energy difference=2358.9. Additional information 30.
2459.3 *2*	0.2	3125.62	(0^+)	666.28	2^+		Additional information 34.
2513.4 *2*	0.10 *3*	2513.55	(2^+)	0.0	0^+		Additional information 20.
2597.7# *5*		4047.1	(2^+)	1449.39	2^+		I_γ: 0.8 *3* (1977SiZT).
2614.5# *5*		3280.5	$(1,2^+)$	666.28	2^+		I_γ: 0.8 *2* (1977SiZT).
2775.9 *3*	0.08 *3*	3442.1	(0^+)	666.28	2^+		Additional information 38.
2814.6 *2*	0.7 *1*	2814.55	(1^+)	0.0	0^+		Additional information 23.
2826.9 *3*	0.10 *3*	2827.01	(2^+)	0.0	0^+		Additional information 26. I_γ: other: $I\gamma(2827)/I\gamma(2161)$=1.0 *2*/3.4 *6* (1977SiZT).
3024.8 *3*	0.10 *2*	3025.19	(1^+)	0.0	0^+		
3176.9 *2*	0.10 *2*	3176.92	$(1,2^+)$	0.0	0^+		Additional information 35.
3199.5# *5*		3199.6	(2)	0.0	0^+		I_γ: 0.6 *2* (1977SiZT).
3280.0# *5*		3280.5	$(1,2^+)$	0.0	0^+		I_γ: 1.1 *3* (1977SiZT).
3348.4# *5*		3348.5	(1^+)	0.0	0^+		I_γ: 0.7 *2* (1977SiZT).

† From 1999Ko46, unless otherwise stated. Values are also given In earlier work 1986ChZI with two of the authors same As In 1999Ko46. Eγ′s from 1977SiZT are in general agreement, Iγ′s are available at E(n)=2.0, 2.2, 2.5, 2.7, 2.9, 3.1, 3.3, 3.5, 3.7, 3.9 and 4.1 MeV. Eγ′s and Iγ′s (at E(n)=4.1 MeV) are given in ENSDF as "document comments" (consult ENSDF database).

‡ From γ(θ) (1989Do14,1988DoZS) and $T_{1/2}$(levels).

γ reported by 1977SiZT only.

@ Placement of transition in the level scheme is uncertain.

^{80}Se(n,n′γ) 1999Ko46,1989Do14,1977SiZT

Level Scheme

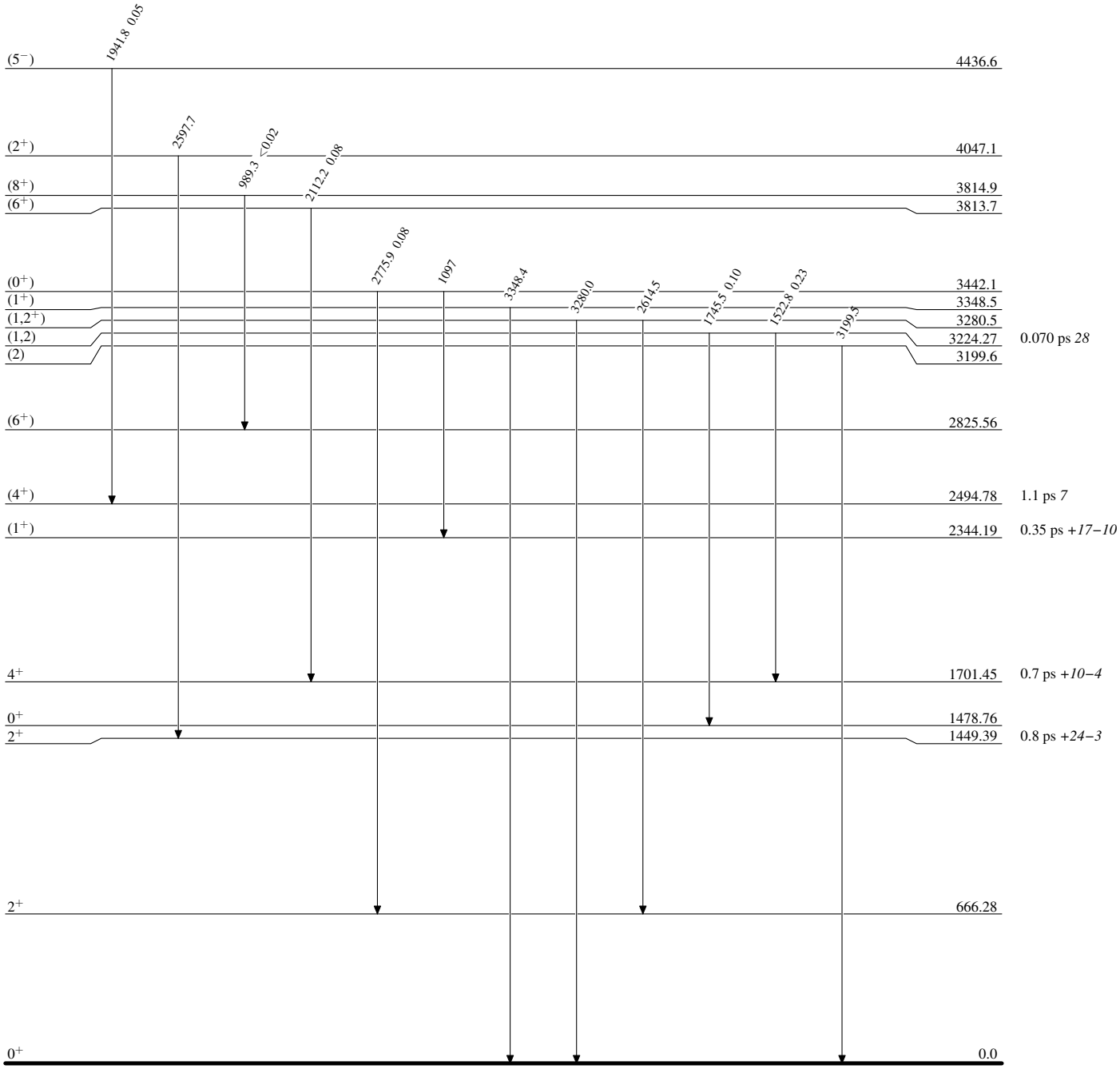
Intensities: Relative I_γ

Legend

$I_\gamma < 2\% \times I_\gamma^{max}$

$I_\gamma < 10\% \times I_\gamma^{max}$

$I_\gamma > 10\% \times I_\gamma^{max}$



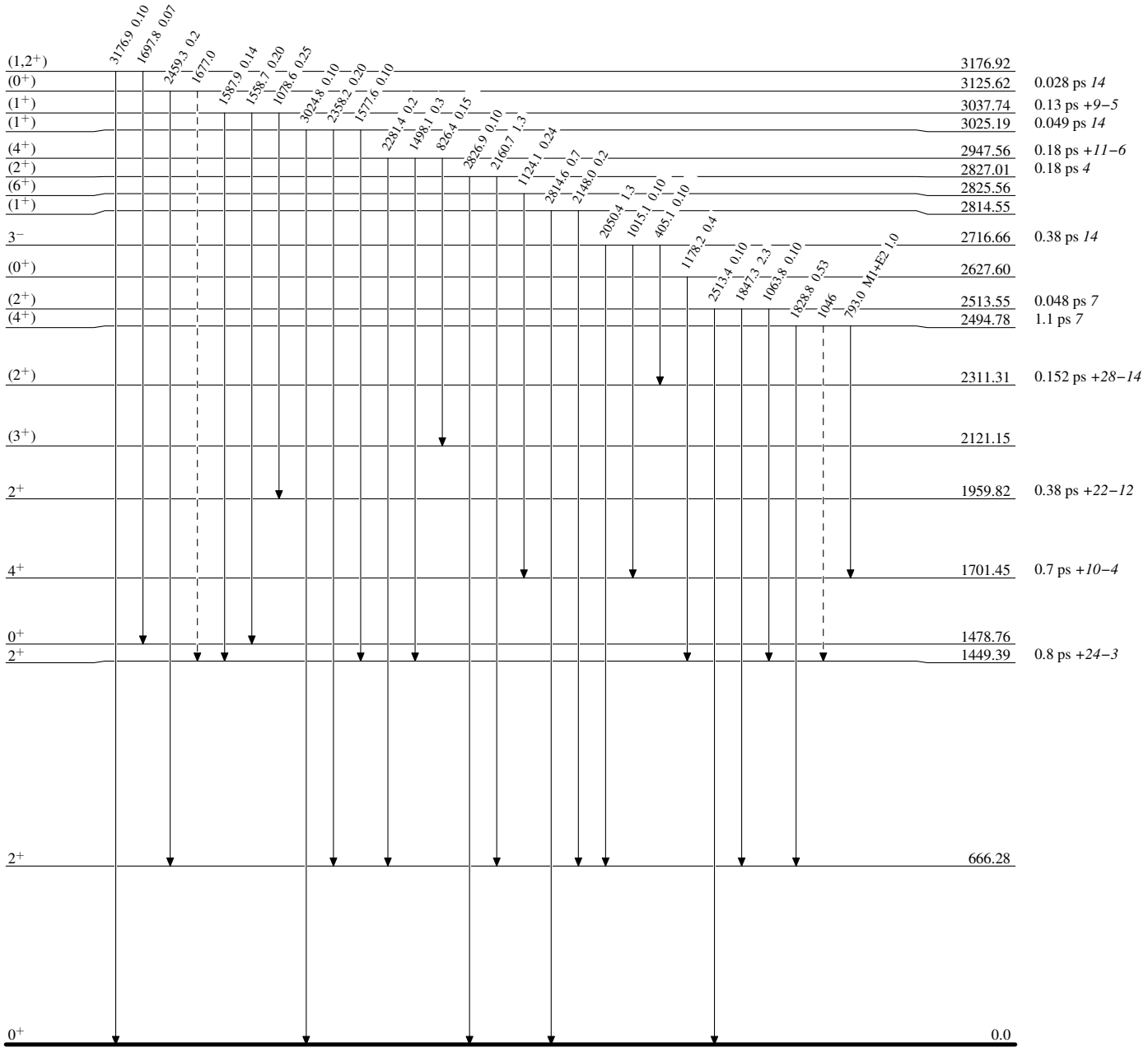
$^{80}_{34}Se_{46}$

^{80}Se(n,n′γ) 1999Ko46,1989Do14,1977SiZT

Level Scheme (continued)

Intensities: Relative I_γ

Legend
- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)

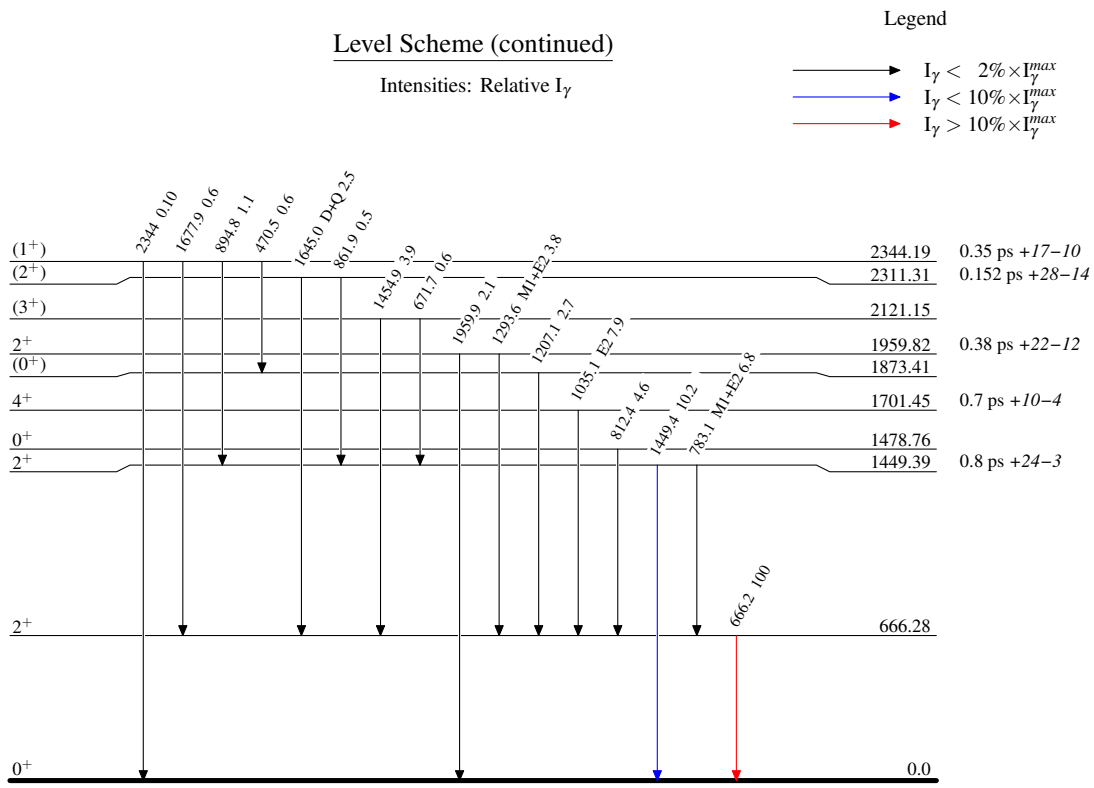


$^{80}_{34}Se_{46}$

^{80}Se(n,n′γ) 1999Ko46,1989Do14,1977SiZT

Level Scheme (continued)

Intensities: Relative I_γ



$^{80}_{34}Se_{46}$