(HI,xnγ) 1984Zo01,1982Ma45,1980We07

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	NDS 74,63 (1995)	22-Dec-1994

1984Zo01: ^{74}Se(α,2nγ) E=25.5 MeV. Measured γ, γγ, γ(θ), excitation functions, $T_{1/2}$(level) by recoil-distance Doppler shift (RDDS) and DSA methods. See also 1981KiZW by the same group for $T_{1/2}$ measurements in ^{73}Ge(α,nγ) reaction at 15-22 MeV.

1982Ma45 (also 1981Ma39): ^{74}Ge(α,2nγ) E=25-33 MeV, main data at E=27 MeV. γ, γγ, γ(θ) for ten angles, γ(lin pol,θ), γγ(t) and excitation functions. Interpretation based on IBA model.

1980We07: ^{71}Ga(^{7}Li,2nγ) E=15-22 MeV, main data at E=18.5 MeV. γ, γγ, γ(θ) at three angles, γγ(θ) (DCO ratios,0° and 90°). Lifetime measurement from Doppler broadening. Interpretation of levels is based on interacting boson model.

Others:

1973Wy01 (also 1971WyZX,1970Li11): ^{74}Ge(α,2nγ) E=29.5 MeV and ^{76}Ge(α,4nγ) E=60 MeV. Measured γ, γγ, γ(θ), ce. γ-ray intensities and ce(K)′s are given for nine prominent transitions.

1982An09: (^{16}O,xnypγ) and (^{12}C,xnypγ), deduced yrast cascade delay times.

^{76}Se Levels

E(level)†	Jπ‡	$T_{1/2}$#	Comments
0.0@	0+		
558.7@ 4	2+		
1215.7& 4	2+	3.5 ps 14	
1330.4@ 5	4+	0.7 ps +5−4	
1688.2& 5	3+	3.2 ps +12−6	
2025.5& 5	4+	1.8 ps 4	
2262.0@ 5	6+	0.62 ps 7	$T_{1/2}$: 0.7 ps 6 (1980We07).
2428.8a 5	3−	14 ps 7	
2488.8& 5	5+	0.9 ps +3−2	
2824.3a 5	5−	6.2 ps +21−14	
2859.2b 6	4−	1.2 ps 5	
2975.7& 6	6+	1.2 ps +7−4	$T_{1/2}$: 0.8 ps 3 (1980We07).
3045.3 6	(5−)	<280 ps	$T_{1/2}$: 2.6 ps 7 (1981KiZW).
3225.3 7	(6,8+)	1.1 ps 3	$T_{1/2}$: from 1981KiZW.
3238.5 7			From 1984Zo01 only.
3261.8b 5	6−	12 ps 6	$T_{1/2}$: 1.3 ps 4 (1981KiZW).
3269.3@ 6	8+	0.35 ps 7	$T_{1/2}$: 0.3 ps 2 (1980We07).
3311.5 6	(6−)	0.14 ns +14−7	
3431.6& 6	7+	0.8 ps +4−2	
3441.1a 6	7−	3.6 ps 7	
3695.8 6	(7−)	28 ps 7	
3785.2 7	(8+)	0.9 ps +5−3	
3853.2 7	(8)+	0.23 ps +8−5	$T_{1/2}$: 0.8 ps 2 (1981KiZW).
4005.1 8			
4008.1b 8	(8−)	2.2 ps 7	
4213.5 7	(8−)	1.7 ps +15−8	
4299.1@ 7	(10)+	0.49 ps +10−7	$T_{1/2}$: 0.6 ps 3 (1980We07).
4324.1a 8	(9)−	1.4 ps 4	
4404.7& 8	(9+)	0.9 ps 2	
4687.0 7	(10)+	0.49 ps 7	
4728.0 7			From 1984Zo01 only. 1981KiZW report $T_{1/2}$(1287γ)=0.6 ps 1.
5067.6b 9	(10)−	1.0 ps +4−2	
5432.1@ 9	(12+)	0.2 ps 1	

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(HI,xnγ) 1984Zo01,1982Ma45,1980We07 (continued)

^{76}Se Levels (continued)

† From least-squares fit to Eγ's.
‡ From Adopted Levels.
# From recoil-distance Doppler shift (RDDS) and/or DSA method (1984Zo01) unless otherwise stated.
@ Band(A): g.s., yrast band.
& Band(B): $K^\pi=2^+$, γ band.
a Band(C): $K^\pi=3^-$ band.
b Band(D): a ΔJ=2 band.

γ(^{76}Se)

γ-ray intensities in ^{71}Ga(^{7}Li,2nγ) E=18.5 MeV (1980We07)

Eγ	Iγ	Eγ	Iγ	Eγ	Iγ
395.9 4	3.1 3	798 2	6.2 12	1129.4 5	11.5 6
438.1 5	3.8 5	800 2	4.4 15	1133 2	
472.9 4	3.8 4	809.5 4	14.2 7	1158.3 6	2.8 5
559.2 3	100 5	884.6 5	12.0 10	1212.3 6	7.7 4
584.1 6	3.0 10	931.4 4	27.1 14	1215.6 6	11.1 6
617.0 5	13 3	942.5 6	3.1 8	1287.2 8	0.8 3
657.1 4	24 4	950.1 6	4.1 8	1493.0 6	6.2 12
694.9 5	19 5	961.5 6	5.0 8	1527.8 6	1.9 7
739 2	0.2 2	1007.2 5	11.0 6	1712.5 8	3.0 11
771.6 4	62 3	1029.3 6	5.2 8		

E_γ†	I_γ†	E_i(level)	J_i^π	E_f	J_f^π	Mult.‡	δ‡	Comments
179.2 *5*	0.9 *1*	3441.1	7^-	3261.8	6^-			
221.0 *5*	1.6 *1*	3045.3	(5^-)	2824.3	5^-			A_2=0.30 *3*, A_4=−0.06 *4*, pol=0.37 *10* (1982Ma45). Additional information 15.
254.5 *5*	1.2 *1*	3695.8	(7^-)	3441.1	7^-			A_2=0.41 *4*, A_4=−0.03 *5*, pol=0.72 *14* (1982Ma45). Additional information 21.
266.1 *5*	2.6 *2*	3311.5	(6^-)	3045.3	(5^-)			A_2=−0.31 *2*, A_4=0.14 *3*, pol=0.15 *6* (1982Ma45).
309.3# *5*	0.17#	4005.1		3695.8	(7^-)			
335.5 *5*	0.62	2824.3	5^-	2488.8	5^+	D+Q	+0.35 *15*	I_γ: from 1984Zo01. A_2=0.44 *4*, A_4=0.00 *4* (1984Zo01), δ=+0.35 *15*.
384.2 *5*	0.5	3695.8	(7^-)	3311.5	(6^-)			I_γ: from 1984Zo01. A_2=−1.1 *1*, A_4=0.12 *16* (1984Zo01), δ≈−0.9.
388.0# *5*	0.7#	4687.0	$(10)^+$	4299.1	$(10)^+$			
395.4 *5*	4.3 *3*	2824.3	5^-	2428.8	3^-	E2		A_2=0.34 *1*, A_4=−0.08 *2*, pol=0.44 *7* (1982Ma45). Additional information 11. (395γ)(1212γ)(DCO)=1.0 *2* (1980We07).
402.7 *5*	1.2 *1*	3261.8	6^-	2859.2	4^-	(E2)		A_2=0.22 *4*, A_4=−0.17 *5*, pol=0.19 *17* (1982Ma45). Additional information 16.
414.2# *5*	1.0#	3238.5		2824.3	5^-			
430.3 *5*	0.8 *1*	2859.2	4^-	2428.8	3^-	M1+E2	−0.7 *+4−12*	A_2=−0.73 *5*, A_4=0.04 *8*, pol=−0.15 *13* (1982Ma45). A_2=−0.40 *5*, A_4=0.00 *5* (1984Zo01), δ=−0.20 *10*.
434.1# *5*	0.34#	3695.8	(7^-)	3261.8	6^-			
437.6 *5*	4.4 *3*	3261.8	6^-	2824.3	5^-	M1+E2	−0.25 *5*	A_2=−0.51 *1*, A_4=0.02 *2*, pol=0.03 *5* (1982Ma45). Additional information 17.

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(HI,xnγ) 1984Zo01,1982Ma45,1980We07 (continued)

γ(^{76}Se) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	δ[‡]	Comments
465.3[#] *5*	0.7[#]	3441.1	7^-	2975.7	6^+			
472.5 *5*	3.2 *2*	1688.2	3^+	1215.7	2^+	E2+M1		A_2=0.38 *2*, A_4=0.10 *3*, pol=0.03 *9*. Deduced δ=+2.1 *9* or +0.75 *+15−44* (1982Ma45). (472γ)(559γ)(DCO)=1.10 *17*; (472γ)(1216γ)(DCO)=1.4 *5* (1980We07). Additional information 5.
487.1 *5*	2.2 *2*	3311.5	(6^-)	2824.3	5^-			Iγ(487γ)/Iγ(266γ)=100/55 (1984Zo01) disagrees with 100/118 from 1982Ma45. A_2=0.21 *2*, A_4=−0.04 *4*, pol=−0.49 *14* (1982Ma45). A_2=0.13 *3*, A_4=0.07 *4* (1984Zo01), δ=+0.25 *5*.
515.7[#] *5*	1.6[#]	3785.2	(8^+)	3269.3	8^+			
518.0[#] *5*	0.7[#]	4213.5	(8^-)	3695.8	(7^-)			
558.8 *5*	100	558.7	2^+	0.0	0^+	E2		A_2=0.21 *1*, A_4=−0.04 *1*, pol=0.33 *1* (1982Ma45). Additional information 1.
562.3 *5*	<2.1	2824.3	5^-	2262.0	6^+			I_γ: from γγ (1984Zo01). 562γ is an unresolved doublet.
583.9 *5*	1.4 *1*	3853.2	$(8)^+$	3269.3	8^+	M1+E2	−0.45 *25*	A_2=0.17 *4*, A_4=0.01 *5*, pol=0.55 *17* (1982Ma45). A_2=0.45 *2*, A_4=−0.02 *3* (1984Zo01), δ=−0.26 *24*. Additional information 22.
616.8 *5*	11.1 *8*	3441.1	7^-	2824.3	5^-	E2		A_2=0.28 *1*, A_4=−0.09 *1*, pol=0.51 *5* (1982Ma45). Additional information 20. (617γ)(395γ)(DCO)=1.0 *3* (1980We07).
650.8[#] *5*	1.0[#]	3695.8	(7^-)	3045.3	(5^-)			
656.8 *5*	15.4 *11*	1215.7	2^+	558.7	2^+	E2+M1	+4.7 *+11−20*	A_2=0.05 *1*, A_4=−0.02 *1*, pol=−0.12 *3* (1982Ma45). Additional information 2. α(K)exp=0.70×10^{-3} *14* (1971WyZX).
694.9 *5*	10.3 *7*	2025.5	4^+	1330.4	4^+	E2+M1	+1.7 *+6−1*	A_2=0.15 *1*, A_4=−0.06 *2*, pol=−0.16 *8* (1982Ma45). A_2=0.48 *14*, A_4=−0.26 *19* (1984Zo01), δ=+0.9 *1*. Additional information 7.
713.8[#] *5*	0.41[#]	2975.7	6^+	2262.0	6^+			I_γ: from γγ.
740.6 *5*	0.24	2428.8	3^-	1688.2	3^+			E_γ,I_γ: from 1984Zo01.
746.3 *5*	4.2 *3*	4008.1	(8^-)	3261.8	6^-	E2		A_2=0.30 *2*, A_4=−0.14 *2*, pol=0.64 *12* (1982Ma45). Additional information 23.
771.5 *5*	65 *5*	1330.4	4^+	558.7	2^+	E2		A_2=0.29 *1*, A_4=−0.07 *1*, pol=0.43 *1* (1982Ma45). Additional information 4. α(K)exp=4.7×10^{-4} *10* (1971WyZX). (772γ)(559γ)(DCO)=0.79 *5* (1980We07).
799.0 *5*	10.7 *8*	2824.3	5^-	2025.5	4^+			I_γ: from γγ. A_2=−0.05 *5* (1984Zo01), δ=+0.04 *4*.
800.6 *5*	6.0 *4*	2488.8	5^+	1688.2	3^+	E2		I_γ: from γγ. A_2=0.37 *8*, A_4=−0.16 *10* (1984Zo01).
809.6 *5*	13.0 *9*	2025.5	4^+	1215.7	2^+	E2		A_2=0.30 *1*, A_4=−0.09 *1*, pol=0.42 *5* (1982Ma45). Additional information 8.

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(HI,xnγ) 1984Zo01,1982Ma45,1980We07 (continued)

γ(^{76}Se) (continued)

E_γ †	I_γ †	E_i(level)	J_i^π	E_f	J_f^π	Mult.‡	δ‡	Comments
833.8 *5*	2.3	4687.0	$(10)^+$	3853.2	$(8)^+$			I_γ: from 1984Zo01.
883.0 *5*	4.6 *3*	4324.1	$(9)^-$	3441.1	7^-	E2		A_2=0.41 *2*, A_4=−0.17 *3*, pol=0.48 *13* (1982Ma45). Additional information 26.
901.7 *5*	1.9 *1*	4213.5	(8^-)	3311.5	(6^-)	E2		A_2=0.20 *3*, A_4=−0.22 *5*, pol=0.43 *25* (1982Ma45). Additional information 24.
931.6 *5*	36 *3*	2262.0	6^+	1330.4	4^+	E2		A_2=0.33 *1*, A_4=−0.11 *1*, pol=0.54 *2* (1982Ma45). Additional information 9. α(K)exp=5.4×10^{-4} *11* (1971WyZX). (932γ)(772γ)(DCO)=1.07 *5* (1980We07).
942.8 *5*	5.0 *4*	3431.6	7^+	2488.8	5^+	E2		A_2=0.20 *1*, A_4=−0.19 *2*, pol=0.53 *11* (1982Ma45). Additional information 19.
950.0 *5*	4.3 *3*	2975.7	6^+	2025.5	4^+	E2		A_2=0.27 *2*, A_4=−0.11 *2*, pol=0.37 *13* (1982Ma45). Additional information 14.
963.3 *5*	2.4 *2*	3225.3	$(6,8^+)$	2262.0	6^+			A_2=0.24 *3*, A_4=−0.03 *4*, pol=0.44 *18* (1982Ma45). A_2=−0.17 *4*, A_4=0.08 *4* (1980We07). Signs of A_2 and A_4 are opposite to those in 1982Ma45 and 1984Zo01. δ=−11 to +0.07. A_2=0.30 *8*, A_4=−0.16 *11* (1984Zo01). E_γ: 961.5 *6* (1980We07), 962.1 (1984Zo01).
973.1 *5*	2.1 *2*	4404.7	(9^+)	3431.6	7^+	(E2)		A_2=0.39 *3*, A_4=−0.09 *4*, pol=0.98 *23* (1982Ma45). Additional information 27.
999.9 *5*	1.8 *1*	3261.8	6^-	2262.0	6^+			A_2=0.57 *3*, A_4=0.11 *4*, pol=−0.49 *28* (1982Ma45). A_2=0.24 *7*, A_4=0.00 *8* (1984Zo01), δ=−0.23 *17*.
1007.2 *5*	18.7 *13*	3269.3	8^+	2262.0	6^+	E2		A_2=0.33 *1*, A_4=−0.14 *1*, pol=0.57 *4* (1982Ma45). Additional information 18. α(K)exp=3.0×10^{-4} *8* (1971WyZX).
1029.8 *5*	9.7 *7*	4299.1	$(10)^+$	3269.3	8^+	E2		A_2=0.34 *1*, A_4=−0.16 *2*, pol=0.66 *8* (1982Ma45). Additional information 25.
1032.0#@ *5*	0.34#	4728.0		3695.8	(7^-)			
1059.4 *5*	2.3 *2*	5067.6	$(10)^-$	4008.1	(8^-)	E2		A_2=0.39 *3*, A_4=−0.10 *5*, pol=0.20 *30* (1982Ma45). Additional information 28.
1129.5 *5*	10.3 *7*	1688.2	3^+	558.7	2^+	E2+M1		A_2=0.47 *1*, A_4=0.03 *1*, pol=−0.02 *8* (1982Ma45). Additional information 6. A_2=0.39 *3*, A_4=−0.13 *3* (1980We07). α(K)exp=3.2×10^{-4} *10* (1971WyZX). (1129γ)(559γ)(DCO)=0.45 *8* (1980We07).
1133.0 *5*	2.4	5432.1	(12^+)	4299.1	$(10)^+$	(E2)		E_γ,I_γ: from 1984Zo01. A_2=0.26 *7*, A_4=−0.04 *11* (1984Zo01).
1158.4 *5*	3.0 *2*	2488.8	5^+	1330.4	4^+	E2+M1	+2.9 *8*	A_2=0.36 *2*, A_4=0.08 *3*, pol=−0.22 *19* (1982Ma45).

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(HI,xnγ) 1984Zo01,1982Ma45,1980We07 (continued)

γ(^{76}Se) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	δ[‡]	Comments
								Additional information 10.
								A_2=0.49 *12*, A_4=−0.27 *10* (1980We07).
								(1158γ)(772γ)(DCO)=1.0 *2* (1980We07).
1169.6 *5*	1.2 *1*	3431.6	7^+	2262.0	6^+	M1(+E2)	+0.08 *15*	A_2=−0.11 *5*, A_4=−0.04 *8*, pol=−0.42 *36* (1982Ma45).
								A_2=0.10 *3*, A_4=0.06 *4* (1984Zo01), δ=+0.20 *5*.
1179.1[#] *5*	1.0[#]	3441.1	7^-	2262.0	6^+			
1213.2 *5*	6.8 *5*	2428.8	3^-	1215.7	2^+			A_2=−0.39 *3*, A_4=0.02 *4* (1984Zo01). δ=−0.27 *13*.
								A_2=−0.14 *4*, A_4=0.03 *4* (1980We07). δ=−5.7 to +0.12.
								(1213γ)(1215γ)(DCO)=2.0 *4* (1980We07).
1215.6 *5*	5.8 *4*	1215.7	2^+	0.0	0^+	E2		A_2=0.29 *5*, A_4=−0.03 *7* (1984Zo01).
								α(K)exp=2.9×10^{-4} *10* (1971WyZX).
								Additional information 3.
1287.0 *5*	0.7	4728.0		3441.1	7^-			E_γ,I_γ: from 1984Zo01. 1980We07 give Eγ=1287.2, Iγ=0.8 *3* and assign it to a 2617 level.
								A_2=0.05 *15*, A_4=−0.22 *17* (1980We07).
1417.7 *5*	1.9 *1*	4687.0	$(10)^+$	3269.3	8^+	E2		A_2=0.57 *4*, A_4=0.00 *6*, pol=0.72 *45* (1982Ma45).
								A_2=0.30 *3*, A_4=−0.09 *4* (1984Zo01).
1467.2[#] *5*	0.41[#]	2025.5	4^+	558.7	2^+			
1493.9 *5*	6.8 *5*	2824.3	5^-	1330.4	4^+	E1(+M2)	+0.03 *5*	A_2=−0.18 *1*, A_4=−0.01 *2*, pol=0.40 *11* (1982Ma45).
								A_2=−0.29 *1*, A_4=0.00 *2* (1984Zo01), δ=−0.07 *3*.
								Additional information 12.
								(1494γ)(772γ)(DCO)=0.78 *21* (1980We07).
1523.5 *5*	1.8	3785.2	(8^+)	2262.0	6^+			A_2=0.5 *1* (1984Zo01).
								E_γ,I_γ: from 1984Zo01. See also comment for 1529γ.
1528.8 *5*	1.2 *1*	2859.2	4^-	1330.4	4^+			This γ placed with a 3790 level by 1980We07 but placement with 2859 level supported by 1984Zo01 and 1982Ma45. Instead, a 1523.5γ is placed with a 3787 level by 1984Zo01.
								A_2=0.44 *4*, A_4=−0.13 *5* (1984Zo01), δ≈+0.4.
								Additional information 13.
1591.1 *5*	2.4	3853.2	$(8)^+$	2262.0	6^+			I_γ: from 1984Zo01 for Eγ=1592.5.
								A_2=0.30 *5* (1984Zo01).
1714.9 *5*	1.4 *1*	3045.3	(5^-)	1330.4	4^+			A_2=−0.25 *4*, A_4=−0.05 *7*, pol=−0.19 *39* (1982Ma45).
								A_2=0.22 *12*, A_4=−0.07 *10* (1980We07).
1870.0 *5*	0.34	2428.8	3^-	558.7	2^+			I_γ: from 1984Zo01. Iγ=2.6 *2* (1982Ma45) gives a branching ratio which disagrees with that in adopted gammas.
								A_2=0.06 *3*, A_4=0.12 *4*, pol=0.29 *27*.

[†] From 1982Ma45, unless otherwise stated. Uncertainty on Eγ assigned as 0.5 keV (evaluator). Intensities are mainly from 1982Ma45 at 55° (relative to the beam direction). In some cases intensities are available from 1984Zo01 only, measured at 20°. The intensities from 1982Ma45 and 1984Zo01 are both from (α,2nγ) reaction at 27 and 25.5 MeV, respectively.

[‡] From γ(θ,pol) and γ(θ) data (1982Ma45,1984Zo01).

[#] γ reported by 1984Zo01 only.

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

(HI,xnγ) 1984Zo01,1982Ma45,1980We07

Level Scheme

Intensities: Relative I_γ

Legend

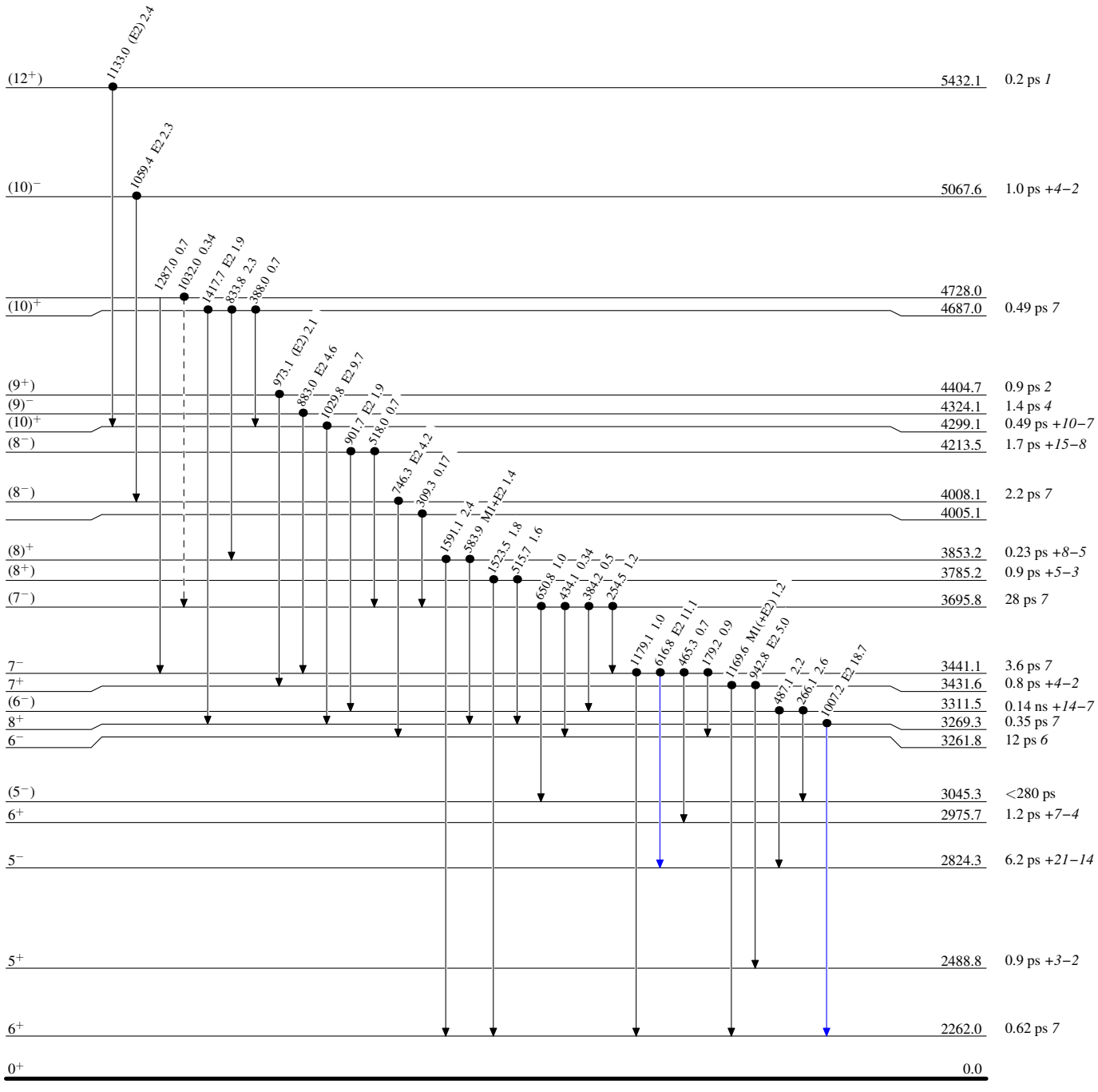
$I_\gamma < 2\% \times I_\gamma^{max}$

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

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

γ Decay (Uncertain)

Coincidence

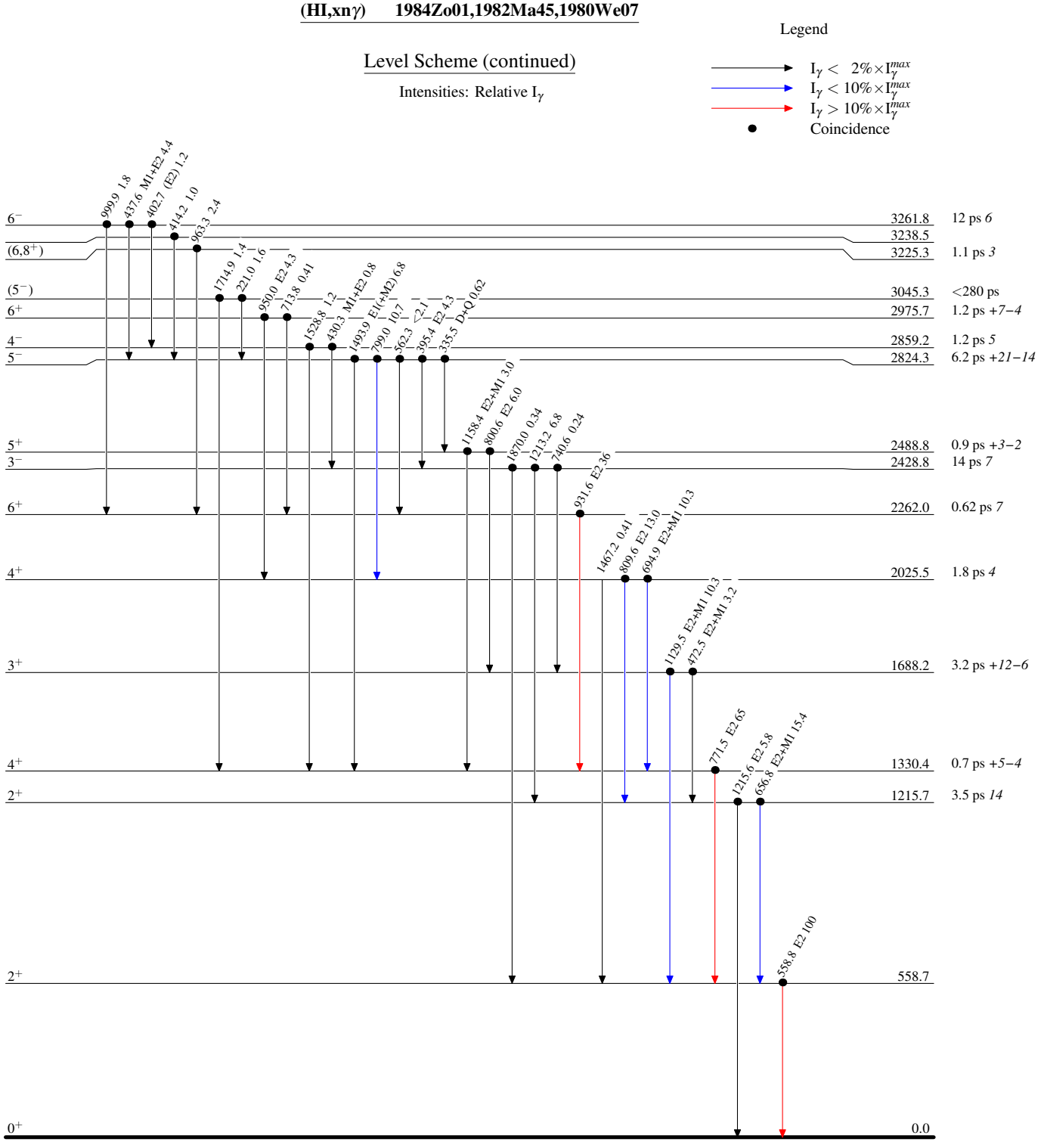


$^{76}_{34}Se_{42}$

(HI,xnγ) 1984Zo01,1982Ma45,1980We07

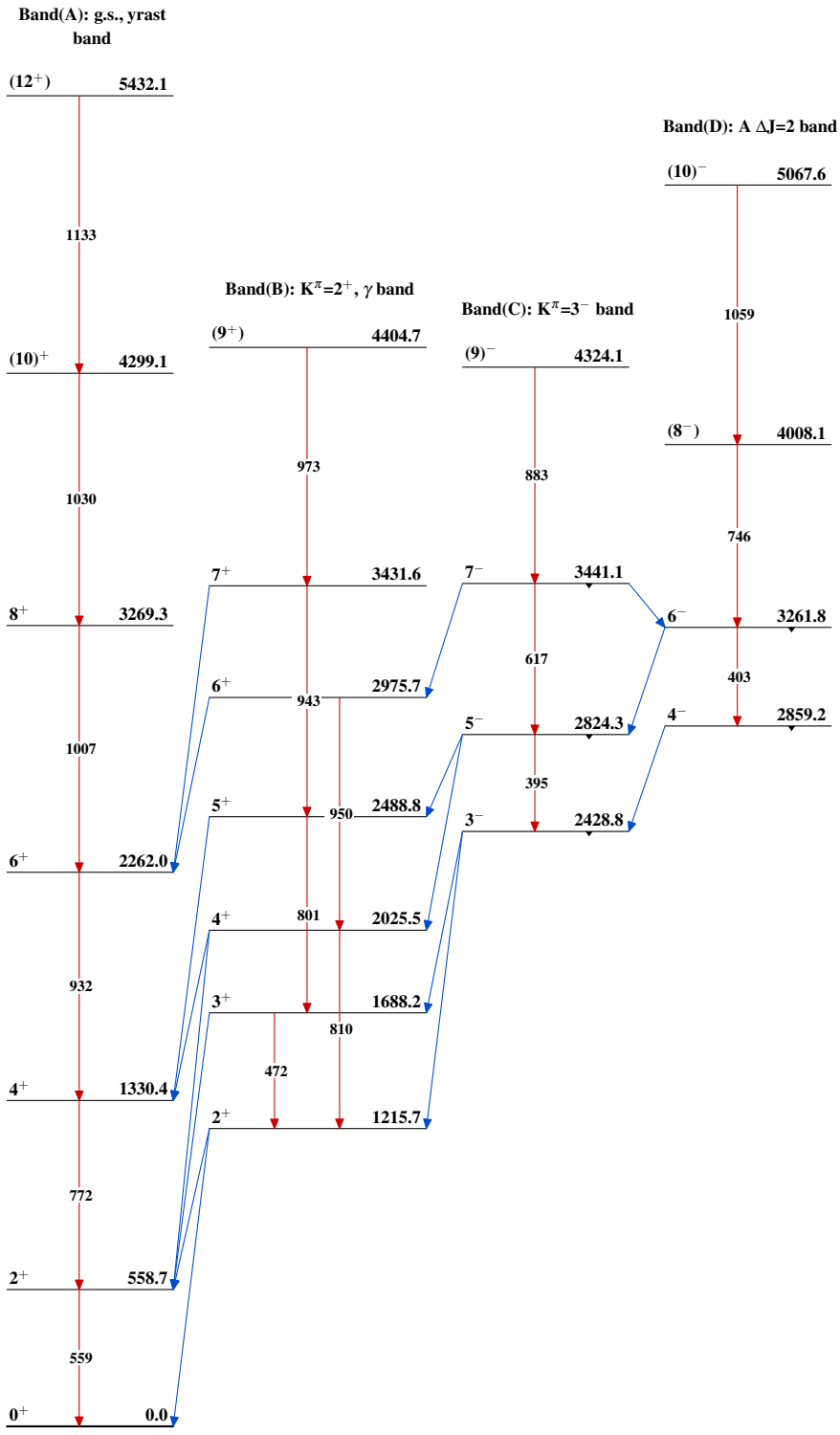
Level Scheme (continued)

Intensities: Relative I_γ



$^{76}_{34}Se_{42}$

(HI,xnγ) 1984Zo01,1982Ma45,1980We07



$^{76}_{34}Se_{42}$