^{150}Sm(^{48}Ca,4nγ) 1991Fa05

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen and Balraj Singh	NDS 177, 1 (2021)	3-Sep-2021

1991Fa05: E=200 MeV ^{48}Ca beam was produced from the Tandem accelerator at Daresbury Laboratory and separated by the Recoil Separator. Target was a foil of self-supporting 500 μg/cm^2 ^{150}Sm. γ rays were detected with the Polytessa array consisting of 20 BGO escape-suppressed Ge detectors. Measured Eγ, Iγ, recoil-γ-coin, recoil-$\gamma(\theta)$, $\gamma\gamma$-coin, $\gamma\gamma(\theta)$. Deduced levels, J, π, γ-ray multipolarities. Comparisons with shell-model calculations. 1991Fa05 also report γ-ray and ce data from ^{162}Dy(^{36}S,4nγ).

1993Wi02: E=205 MeV ^{48}Ca beam was produced from the 88-inch cyclotron at the Lawrence Berkeley Laboratory. Target was 1.1 mg/cm^2 metallic Sm foil, enriched in ^{150}Sm, on a 10 mg/cm^2 Au backing. γ rays were detected with the HERA array consisting of 20 Compton-suppressed Ge detectors and an inner BGO ball of 32 elements as a sum-energy and multiplicity filter. Measured Eγ, $\gamma\gamma$-coin, Doppler shift attenuation (DSA). Deduced lifetimes and quadrupole moments for superdeformed (SD) states in ^{194}Pb. Comparisons with theoretical calculations. See SD data in (HI,xnγ):SD dataset.

Level scheme proposed by 1991Fa05 is different from that in Adopted dataset, which is adopted by evaluators from that of 2009Ku03 in (^{30}Si,4nγ) because of higher statistics and completeness.

See SD data from 1993Wi02 in (HI,xnγ):SD dataset.

^{194}Pb Levels

E(level)[†]	J$^{\pi}$[#]	E(level)[†]	J$^{\pi}$[#]	E(level)[†]	J$^{\pi}$[#]	E(level)[†]	J$^{\pi}$[#]
0.0[a]	0^+	3561.8[c] *9*	14^+	5110.7[@] *10*	17^-	596.6+x?[b] *6*	J+3
965.4[a] *3*	2^+	3729.0 *8*	12	5168.5[d] *11*	20^+	6206.4[e] *11*	
1540.5[a] *5*	4^+	3840.5 *9*	13^-	5236.3[&] *10*	17^+	6273.7[&] *11*	21^+
1820.6[a] *6*	5^-	4003.6[e] *9*	15^-	5258.7 *10*	(20^+)	6379.3[c] *11*	22^+
2135.9 *6*	6^+	4136.8[c] *9*	16^+	5307.8[@] *10*	18^-	6400.4 *12*	22^-
2241.7[a] *6*	7^-	4367.1 *9*	14	5329.8 *10*	19	6468.3[&] *12*	23^+
2407.7[a] *7*	9^-	4369.7[d] *10*	17^+	5402.7[d] *11*	20^+	994.0+x[b] *6*	J+4
2438.3 *6*	(8^+)	4376.3[e] *10*	16^-	5551.6[e] *10*	19^-	1131.0+x[b] *7*	J+5
2581.4[a] *8*	10^+	4450.2 *9*	15^-	5553.0[c] *10*	20^+	6798.2 *13*	23^-
2628.5 *8*	12^+	4454.3? *9*	15	5565.5[&] *10*	19^+	6817.1 *13*	23
2701.1? *7*	(9)	4601.2 *10*	17^-	5568.1[@] *11*	19^-	1507.7+x[b] *8*	J+6
2761.5 *7*	9^-	4657.9[d] *10*	18^+	x[‡][b]	J	1719.9+x[b] *8*	J+7
2914.5 *7*	9^-	4702.4[e] *10*	18^-	5687.8[@] *11*	20^-	1917.0+x[b] *8*	J+8
2933.5 *8*	11^-	4750.7? *10*	17	163.1+x[b] *3*	J+1	2083.6+x[b] *9*	J+8
3045.6 *8*	10^-	4796.5[c] *10*	18^+	5732.2 *11*	20^-	2344.4+x[b] *9*	J+9
3189.0 *8*	(11)	4836.6 *10*	18^-	5760.0[d] *11*	21^+	2409.2+x[b] *10*	J+10
3298.2 *9*	12^-	4965.6[@] *10*	16^-	466.2+x[b] *5*	J+2	2677.1+x[b] *10*	J+11
3306.6 *8*	11^-	5005.9[d] *11*	19^+	6063.8[@] *12*	21^-	2984.9+x[b] *11*	J+12
3550.3 *8*	11^-	5061.7? *10*	(17^-)	6065.0[&] *11*	20^-	3212.9+x[b] *11*	J+14

[†] From a least-squares fit to γ-ray energies, assuming ΔEγ=0.3 keV for those quoted to tenth of a keV and 1 keV for those quoted to keV.

[‡] This level probably feeds the 5553, 4796 and 4147 levels (1991Fa05).

[#] Proposed by 1991Fa05 based on $\gamma\gamma(\theta)$, γ-decay patterns, and band assignments.

[@] Band(A): Band based on 16^-.

[&] Seq.(D): Sequence based on 17^+.

[a] Seq.(E): Sequence based on g.s.

[b] Band(B): Floating ΔJ=1 band. This band is ΔJ=1 band #1 in 2009Ku03, connected to the lower levels in the level scheme. See ^{168}Er(^{30}Si,4nγ) dataset from 2009Ku03 or the Adopted dataset for details.

[c] Band(C): Band based on 14^+.

[d] Seq.(F): Sequence based on 17^+.

[e] Seq.(G): Sequence based on 15^-.

^{150}Sm(^{48}Ca,4nγ) 1991Fa05 (continued)

γ(^{194}Pb)

Some transitions are placed differently from those in Adopted Level, Gammas, as noted.

Eγ†	Iγ†	Ei(level)	Jπi	Ef	Jπf	Mult.#	α@	Comments
47.0	0.04 *CA*	2628.5	12+	2581.4	10+	[E2]	221.1	Iγ: from intensity balance at 2628.7 level. Eγ: transition seen in ce data (ce(L1), ce(L2), ce(L3), ce(M) lines corresponding to 47.0 keV observed).
64.8‡	0.9 *3*	2409.2+x	J+10	2344.4+x	J+9	D		Iγ: uncertain due to shielding of detectors (1991Fa05). R(θ)=0.42 *13*.
119.7‡	1.4 *1*	5687.8	20−	5568.1	19−	(D)		R(θ)=0.82 *10*.
130.4‡	0.60 *5*	596.6+x?	J+3	466.2+x	J+2	(D)		R(θ)=0.93 *12*.
137.0‡	0.58 *5*	1131.0+x	J+5	994.0+x	J+4	D		R(θ)=0.65 *7*.
143.5‡	0.5 *1*	3189.0	(11)	3045.6	10−			R(θ)=1.33 *14*.
145.1‡	3.3 *2*	5110.7	17−	4965.6	16−	(D)		R(θ)=1.03 *5*.
162.4‡	0.75 *5*	5168.5	20+	5005.9	19+	D		R(θ)=0.60 *6*, 1.2 *3*.
163.1‡	1.2 *1*	163.1+x	J+1	x	J	D		R(θ)=0.87 *5*.
166.0	19 *3*	2407.7	9−	2241.7	7−	Q		R(θ)=1.6 *2*.
173.7	30.0 *15*	2581.4	10+	2407.7	9−	D		R(θ)=0.7 *2* from recoil-γγ-coin.
178.7‡	0.77 *5*	3729.0	12	3550.3	11−	(D)		R(θ)=1.05 *5*.
194.6‡	0.7 *1*	6468.3	23+	6273.7	21+	(Q)		R(θ)=1.3 *2*.
197.1‡	5.4 *2*	5307.8	18−	5110.7	17−	D		R(θ)=0.89 *5*, 1.3 *2*.
208.7‡	1.4 *1*	6273.7	21+	6065.0	20−	D		R(θ)=0.75 *7*.
212.2‡	0.90 *5*	1719.9+x	J+7	1507.7+x	J+6	D		R(θ)=0.76 *5*.
228.0‡	0.46 *5*	3212.9+x	J+14	2984.9+x	J+12	(Q)		R(θ)=1.67 *9*.
232.9‡	0.95 *5*	4369.7	17+	4136.8	16+	D		R(θ)=0.71 *8*, 0.76 *2*.
260.3‡	6.7 *2*	5568.1	19−	5307.8	18−	(D)		R(θ)=0.98 *4*, 0.9 *2*.
260.8‡	0.72 *5*	2344.4+x	J+9	2083.6+x	J+8	(D)		R(θ)=1.07 *6*.
261.0‡	0.60 *5*	3306.6	11−	3045.6	10−	D		R(θ)=0.83 *6*, 0.9 *2*.
267.9‡	0.47 *5*	2677.1+x	J+11	2409.2+x	J+10	(D)		R(θ)=0.96 *5*.
270.7‡	2.3 *2*	5236.3	17+	4965.6	16−	(D)		R(θ)=0.94 *5*.
280.1	44.0 *15*	1820.6	5−	1540.5	4+	D		R(θ)=1.01 *2*, 0.9 *1*.
284.3‡	0.82 *5*	3045.6	10−	2761.5	9−	(D)		R(θ)=1.03 *8*, 0.8 *2*.
288.2‡	1.1 *1*	4657.9	18+	4369.7	17+	(D)		R(θ)=0.9 *1*.
302.4	0.3 *1*	2438.3	(8+)	2135.9	6+			
303.1‡	3.0 *1*	466.2+x	J+2	163.1+x	J+1	D		R(θ)=0.77 *4*.
305.0	10.0 *20*	2933.5	11−	2628.5	12+			
307.8‡	0.35 *5*	2984.9+x	J+12	2677.1+x	J+11	D		R(θ)=0.88 *5*.
326.1	3.2 *1*	4702.4	18−	4376.3	16−	(Q)		R(θ)=2.7 *1*.
329.2‡	2.0 *2*	5565.5	19+	5236.3	17+	(Q)		R(θ)=1.5 *1*.
336.6‡	4.8 *2*	6400.4	22−	6063.8	21−	D		R(θ)=0.78 *3*.
348.0‡	1.2 *1*	5005.9	19+	4657.9	18+	D		R(θ)=0.75 *10*.
352.2	16.5 *10*	2933.5	11−	2581.4	10+	D		R(θ)=0.84 *14*, 0.7 *2*.
361.5‡	0.44 *5*	3550.3	11−	3189.0	(11)	(D)		R(θ)=1.1 *1*.
363.7‡	1.4 *1*	2083.6+x	J+8	1719.9+x	J+7	(D)		R(θ)=1.01 *5*.
364.6‡	12.3 *5*	3298.2	12−	2933.5	11−	D		R(θ)=1.05 *5*.
372.7	4.8 *2*	4376.3	16−	4003.6	15−	D		R(θ)=0.74 *4*, 0.64 *10*.

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^{150}Sm(^{48}Ca,4nγ) 1991Fa05 (continued)

γ(^{194}Pb) (continued)

E_γ †	I_γ †	E_i(level)	J_i^π	E_f	J_f^π	Mult.#	Comments
376.0‡	6.6 *2*	6063.8	21⁻	5687.8	20⁻	D	R(θ)=0.96 *5*, 0.68 *14*.
376.7‡	2.1 *1*	1507.7+x	J+6	1131.0+x	J+5	D	R(θ)=0.77 *4*.
396.8‡	0.80 *5*	5402.7	20⁺	5005.9	19⁺	D	R(θ)=0.56 *11*.
397.4‡	2.2 *1*	994.0+x	J+4	596.6+x?	J+3	D	R(θ)=0.88 *4*.
397.8‡	2.0 *2*	6798.2	23⁻	6400.4	22⁻	(M1)	E_γ: It could correspond to 396.8γ from 8259 level or 395.0γ from 7182 level in 2009Ku03. R(θ)=0.74 *9*, 1.0 *2*.
409.3‡	0.27 *5*	1917.0+x	J+8	1507.7+x	J+6	(Q)	R(θ)=1.76 *24*.
416.7‡	2.1 *1*	6817.1	23	6400.4	22⁻	D	R(θ)=0.74 *6*.
421.1	44.0 *15*	2241.7	7⁻	1820.6	5⁻	Q	R(θ)=1.19 *3*, 1.4 *2*.
441.8	12.0 *2*	4003.6	15⁻	3561.8	14⁺	D	R(θ)=0.98 *4*, 0.9 *2*.
459.4‡	1.1 *2*	2701.1?	(9)	2241.7	7⁻	(Q)	R(θ)=1.12 *9*.
460.4‡	0.7 *2*	4836.6	18⁻	4376.3	16⁻	(Q)	R(θ)=1.35 *11*.
462.2	2.0 *1*	5258.7	(20⁺)	4796.5	18⁺		
499.5‡	1.9 *1*	6065.0	20⁻	5565.5	19⁺	D	R(θ)=0.69 *8*.
515.4	14.0 *4*	4965.6	16⁻	4450.2	15⁻	D	R(θ)=0.90 *2*, 0.6 *1*.
519.8‡	2.2 *2*	2761.5	9⁻	2241.7	7⁻	(Q)	R(θ)=1.57 *9*, 1.7 *2*.
526.6	1.8 *1*	4367.1	14	3840.5	13⁻	D	R(θ)=0.64 *6*.
542.2‡	11.9 *5*	3840.5	13⁻	3298.2	12⁻	D	R(θ)=0.79 *4*, 0.86 *14*.
575.0	12.6 *2*	4136.8	16⁺	3561.8	14⁺	(Q)	R(θ)=1.51 *7*, 1.4 *1*.
575.1	76.0 *15*	1540.5	4⁺	965.4	2⁺	Q	R(θ)=1.31 *5*, 1.4 *1*.
591.3‡	1.1 *1*	5760.0	21⁺	5168.5	20⁺		
595.4	2.2 *1*	2135.9	6⁺	1540.5	4⁺	Q	R(θ)=1.6 *2*, 1.0 *2*.
597.6	2.8 *1*	4601.2	17⁻	4003.6	15⁻	(Q)	R(θ)=1.7 *2*, 1.0 *2*.
609.7	18.0 *5*	4450.2	15⁻	3840.5	13⁻	Q	R(θ)=1.82 *6*, 1.3 *2*.
613.9‡	0.90 *5*	4750.7?	17	4136.8	16⁺	D	E_γ: this γ could also correspond to the 614.8γ from 5409 level in 2009Ku03. R(θ)=0.81 *10*.
654.8	0.63 *5*	6206.4		5551.6	19⁻		
659.7	5.3 *1*	4796.5	18⁺	4136.8	16⁺	Q	R(θ)=1.73 *7*.
672.8	1.3 *2*	2914.5	9⁻	2241.7	7⁻	(Q)	R(θ)=1.76 *14*.
715.0‡	0.71 *5*	5551.6	19⁻	4836.6	18⁻		(D) from R(θ)=0.93 *14* inconsistent with Adopted level scheme.
728.6	0.78 *5*	5329.8	19	4601.2	17⁻		(D) from R(θ)=0.93 *14* inconsistent with Adopted level scheme.
754.4‡	1.6 *4*	5760.0	21⁺	5005.9	19⁺		
756.5	2.6 *5*	5553.0	20⁺	4796.5	18⁺	(Q)	R(θ)=1.75 *7*.
788.6‡	1.2 *1*	3550.3	11⁻	2761.5	9⁻	(Q)	R(θ)=1.13 *7*, 1.4 *4*.
826.3	0.5 *1*	6379.3	22⁺	5553.0	20⁺	(Q)	R(θ)=3.0 *4*.
849.1	0.74 *5*	5551.6	19⁻	4702.4	18⁻		
892.5	0.7 *1*	4454.3?	15	3561.8	14⁺	D	R(θ)=0.41 *7*.
907.1	10.5 *2*	3840.5	13⁻	2933.5	11⁻	Q	R(θ)=1.9 *1*, 1.4 *2*.
933.3	26.0 *5*	3561.8	14⁺	2628.5	12⁺	Q	R(θ)=1.68 *7*, 1.4 *2*.
965.4	80.0 *15*	965.4	2⁺	0.0	0⁺	Q	R(θ)=1.34 *4*, 1.4 *2*.
1029.8	0.5 *1*	5732.2	20⁻	4702.4	18⁻		
1058.1	0.6 *1*	5061.7?	(17⁻)	4003.6	15⁻		

† From 1991Fa05, unless otherwise noted. Quoted values of intensities are normalized to 80 for the 965.4γ.
‡ Placed from a different level in Adopted Levels, Gammas.

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^{150}Sm(^{48}Ca,4nγ) 1991Fa05 (continued)

γ(^{194}Pb) (continued)

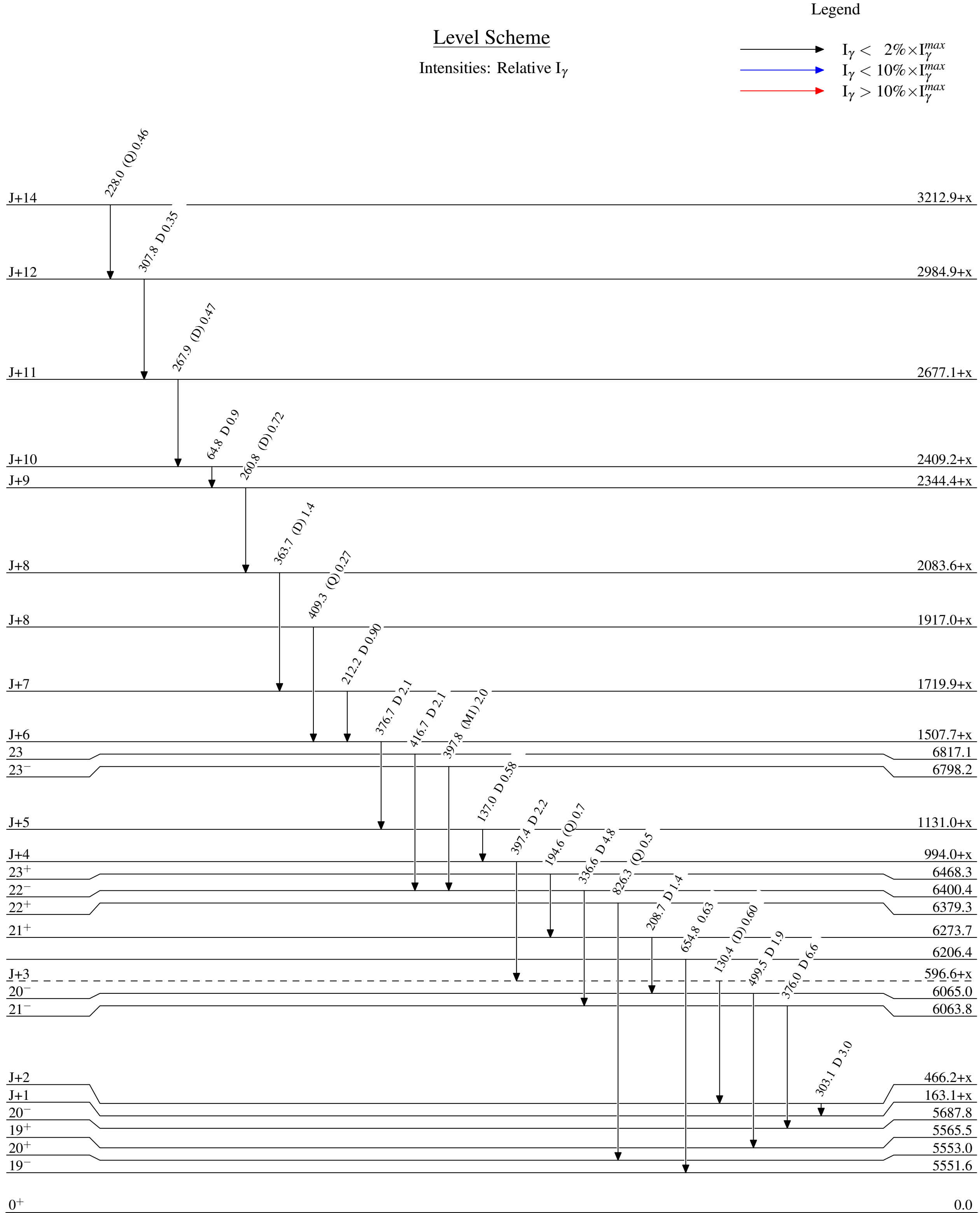
From angular correlation ratio R(θ)=2Iγ(37°)/(Iγ(79°)+Iγ(101°)) (1991Fa05) from $\gamma\gamma$(θ), given under comments. In selected cases, a second value is given, which is from recoil-$\gamma\gamma$ data.

@ 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.

$^{150}Sm(^{48}Ca,4n\gamma)$ 1991Fa05

Level Scheme

Intensities: Relative I_γ

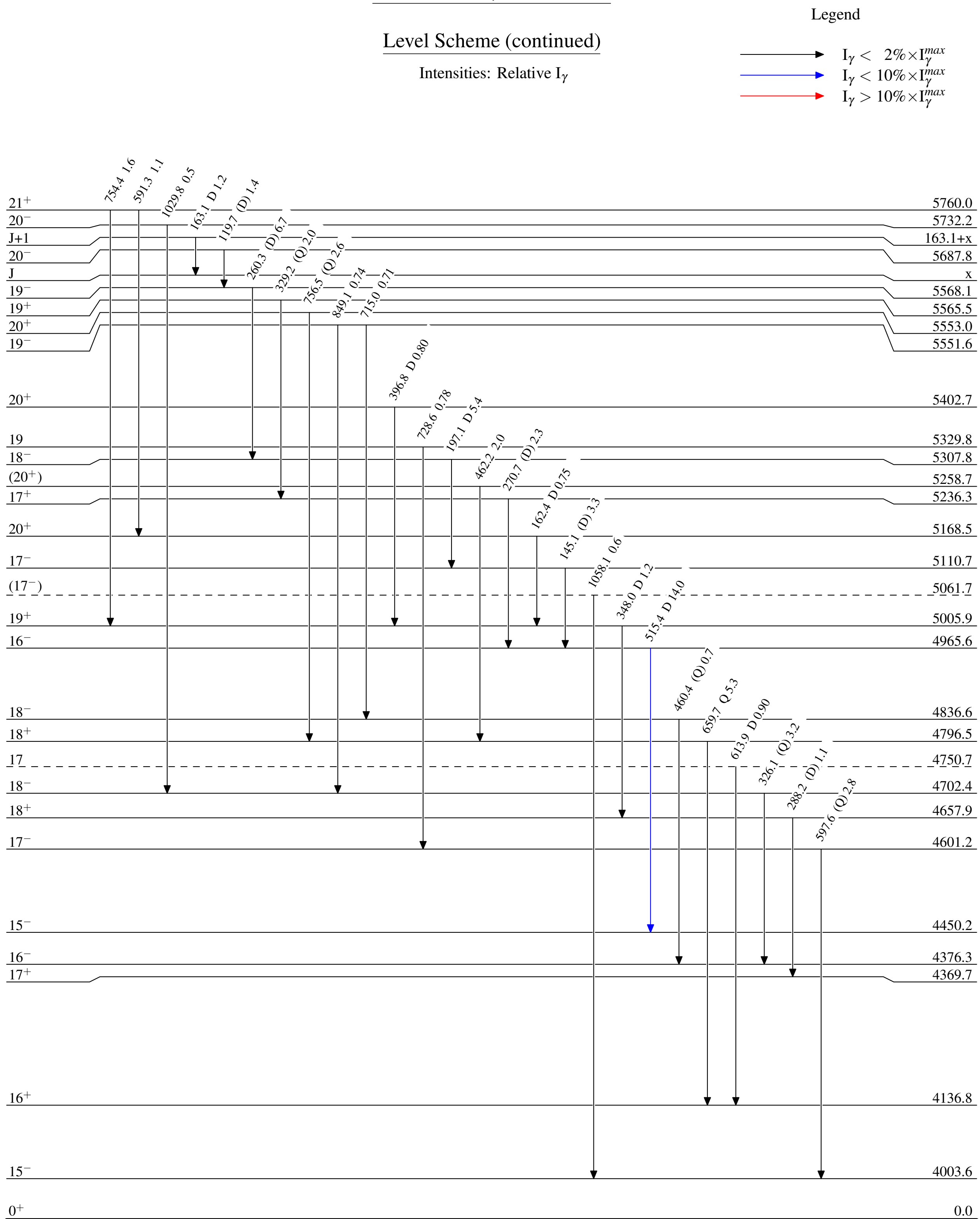


$^{194}_{82}Pb_{112}$

$^{150}Sm(^{48}Ca,4n\gamma)$ 1991Fa05

Level Scheme (continued)

Intensities: Relative I_γ

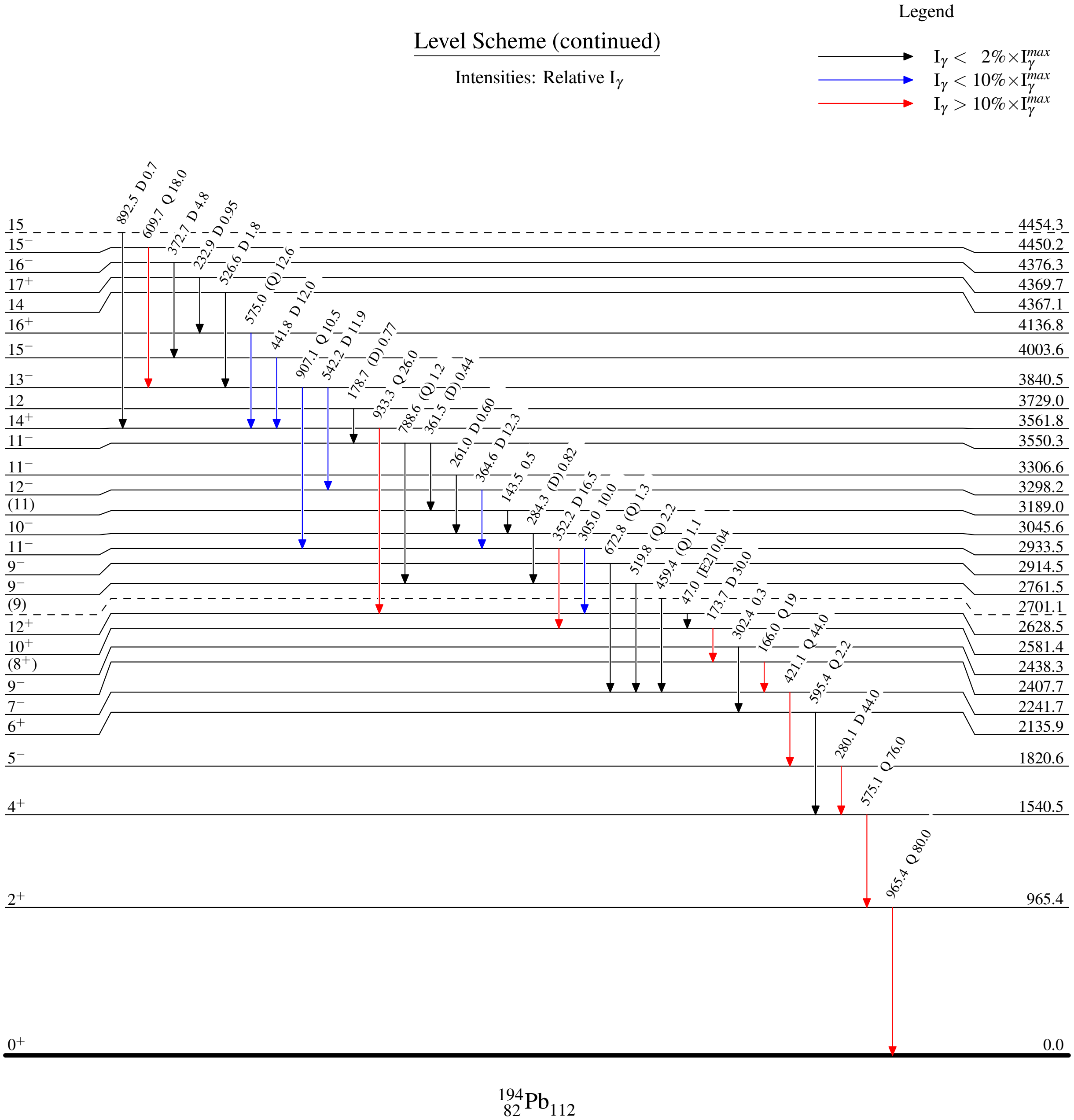


$^{194}_{82}Pb_{112}$

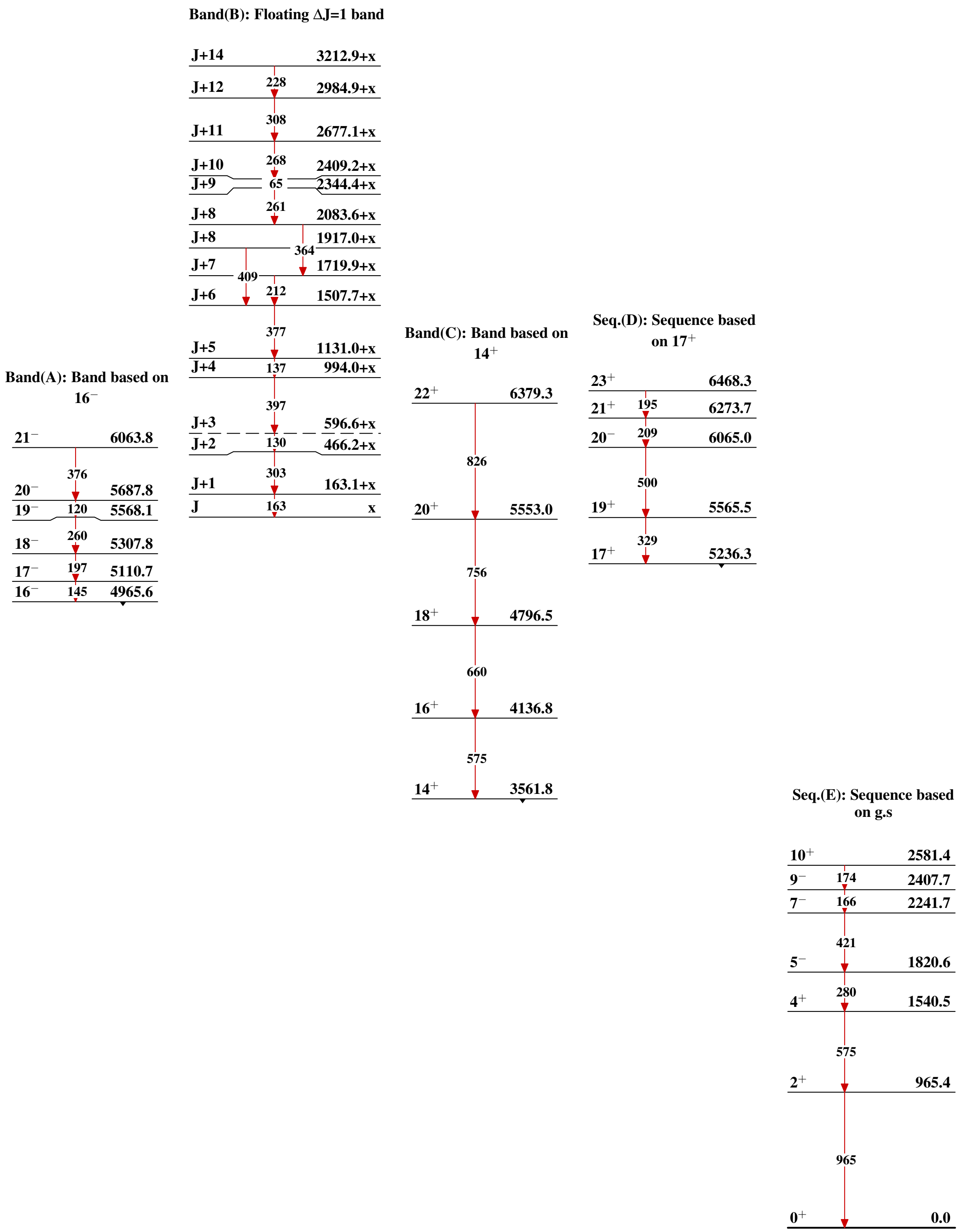
$^{150}Sm(^{48}Ca,4n\gamma)$ 1991Fa05

Level Scheme (continued)

Intensities: Relative I_γ

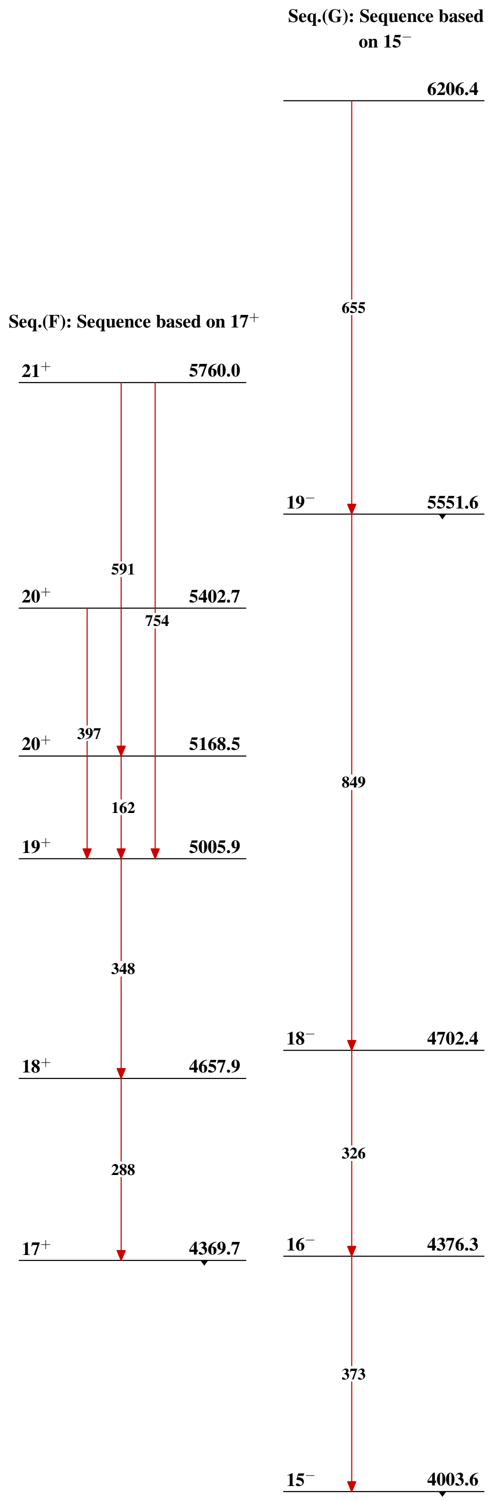


^{150}Sm(^{48}Ca,4nγ) 1991Fa05



$^{194}_{82}Pb_{112}$

^{150}Sm(^{48}Ca,4nγ) 1991Fa05 (continued)



$^{194}_{82}Pb_{112}$