Gd(^{20}Ne,xnγ), ^{122}Sn(^{52}Cr,4nγ) 1994Mc06,1985Re06,1983Re03

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	C. M. Baglin[1], E. A. Mccutchan[2], S. Basunia[1]	NDS 153, 1 (2018)	1-Oct-2018

1994Mc06: ^{122}Sn(^{52}Cr,4nγ), E=230 MeV; measured Iγ, $\gamma\gamma$ coin; deduced $T_{1/2}$ using Doppler-shift recoil distance or Doppler-broadened line shape analysis; deduced (model-dependent) transition quadrupole moments for 17 states.
1985Re06: ^{154}Gd(^{20}Ne,4nγ), E=105-125 MeV, 97% ^{154}Gd target; measured Eγ, Iγ, $\gamma\gamma$-coin, $\gamma(\theta)$, γ linear polarization; pairing self-consistent cranking calculations, particle-number projections.
1983Re03: ^{154}Gd(^{20}Ne,4nγ), E=105,110,120 MeV; measured Eγ, Iγ, $\gamma\gamma$-coin, I(ce), and Iγ(25°)/Iγ(90°).
1983Ar09: ^{155}Gd(^{20}Ne,5nγ), E=100-130 MeV; measured Eγ, Iγ, $\gamma\gamma$-coin, $\gamma(\theta)$ at E(^{20}Ne)=110 MeV.
1980Mi16: ^{155}Gd(^{20}Ne,5nγ), E=105 MeV; measured Doppler recoil distance.

^{170}W Levels

See 1994Mc06 for transition quadrupole moments deduced for 17 states; values range between 4.6 and 7.8 eb.

E(level)	J$^{\pi}$ †	$T_{1/2}$ ‡	Comments
0.0#	0+		
156.7# 3	2+	497 ps 10	$T_{1/2}$: from (^{20}Ne,5nγ) using Doppler recoil-distance method (1980Mi16). Other data: 0.50 ns 10 (1994Mc06).
462.5# 5	4+	19.6 ps 19	$T_{1/2}$: weighted average of 21.1 ps 14 from 1980Mi16 and 17.3 ps 17 (1994Mc06).
875.7# 6	6+	4.3 ps 3	$T_{1/2}$: weighted average of 4.5 ps 3 from 1980Mi16 and 3.9 ps 5 (1994Mc06).
1363.4# 6	8+	1.9 ps 5	
1517.3& 6	5−		
1791.8& 6	7−	30 ps 7	
1810.8a 6	(6−)		
1901.5# 6	10+	1.30 ps 24	
2153.6& 6	9−	4.9 ps 10	
2203.4a 6	(8−)		
2464.2# 7	12+	1.11 ps 21	
2551.8b 6	(10−)		
2577.5& 7	11−	3.0 ps 8	
2610.0a 7	(10−)		
2898.4b 7	(12−)	15 ps 3	
2910.8@ 8	14+	3.6 ps 7	
3036.0& 7	13−	2.0 ps 5	
3094.4a 8	(12−)		
3117.9# 8	14+		
3343.7@ 8	16+	2.6 ps 3	
3354.5b 8	(14−)		
3537.5& 8	15−		
3652.2a 8	(14−)		
3815.8# 8	16+		
3873.9@ 9	18+	1.29 ps 24	
3886.8b 8	(16−)		
4094.6& 8	17−		
4230.5a 9	(16−)		
4460.3b 9	(18−)		

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Gd(^{20}Ne,xnγ), ^{122}Sn(^{52}Cr,4nγ) 1994Mc06,1985Re06,1983Re03 (continued)

^{170}W Levels (continued)

E(level)	J$^{\pi}$†	T$_{1/2}$‡	Comments
4490.4@ 9	20$^+$	0.37 ps 5	T$_{1/2}$: weighted average of 0.35 ps +6−4 from Doppler-broadened line shape analysis and 0.49 ps 13 from Doppler-shift recoil distance analysis (in (^{52}Cr,4nγ), 1994Mc06).
4684.5& 9	19$^-$		
5056.7b 9	(20$^-$)		
5176@ 1	22$^+$	0.17 ps 4	T$_{1/2}$: from Doppler-broadened line shape analysis in (^{52}Cr,4nγ); other value: 0.19 ps +6−3 (assuming alternative stopping power values) (1994Mc06).
5276.2& 9	21$^-$		
5671.4b 10	(22$^-$)		
5894.6& 10	23$^-$		
5918@ 1	24$^+$	0.26 ps +6−4	T$_{1/2}$: from Doppler-broadened line shape analysis in (^{52}Cr,4nγ); other value: 0.24 ps +8−3 (assuming alternative stopping power values) (1994Mc06).
6334.1b 10	(24$^-$)		
6587.6& 10	25$^-$		
6713.7@ 11	26$^+$		
7086.1?b 15	(26$^-$)		
7359.2& 11	27$^-$		
7568.8@ 11	28$^+$		
8202?&	(29$^-$)		
8487.7@ 12	30$^+$		
9431.7@ 14	(32$^+$)		
10390.6?@ 16	(34$^+$)		
11370.2?@ 19	(36$^+$)		

† From 1985Re06 based on γ(θ), γ linear polarization, and band structure.

‡ From 1994Mc06 using (^{52}Cr,4nγ) reaction and Doppler-shift recoil distance or Doppler-broadened line shape analysis, except as noted. 1983Re03 searched for isomeric states using recoil shadow method, and observed no delayed ce with T$_{1/2}$≥1 ns.

Band(A): K$^{\pi}$=0$^+$, α=0 g.s. band.

@ Band(B): (ν i$^2_{13/2}$), α=0 s band. Two quasi-particle AB band, crossed by (ν i$^2_{13/2}$)(π i$^2_{13/2}$) band At ħω=0.45 MeV.

& Band(c): (ν i$_{13/2}$)(ν f$_{7/2}$), α=1 band. Signature partner of (ν i$_{13/2}$)(ν f$_{7/2}$), α=0 band; please see comments on that band.

a Band(C): (ν i$_{13/2}$)(ν f$_{7/2}$), α=0 band. Predominantly a two quasi-particle AE band for ħω≥0.2 MeV, but possibly includes strong octupole vibration component at lower rotational frequencies (1985Re06).

b Band(D): π=−, α=0 band. Predominantly a two quasi-particle BF band for ħω≥0.2 MeV, but possibly includes strong octupole vibration component at lower rotational frequencies (1985Re06).

γ(^{170}W)

E$_{\gamma}$†	I$_{\gamma}$‡	E$_i$(level)	J$^{\pi}_i$	E$_f$	J$^{\pi}_f$	Mult.#	α^f	Comments
156.8@ 2	81 8	156.7	2$^+$	0.0	0$^+$	E2b	0.716	I$_{\gamma}$: 104 in (^{52}Cr,4nγ) (1994Mc06). A$_2$=+0.15 1; A$_4$=−0.05 2 (1985Re06).
x220.2 3	5.3 16					Q		A$_2$=+0.32 5, A$_4$=−0.14 8 (1985Re06).
252.1 3	2.6 8	2153.6	9$^-$	1901.5	10$^+$	D		I$_{\gamma}$: 1.8 in (^{52}Cr,4nγ) (1994Mc06). A$_2$=−0.19 8; A$_4$=+0.04 10 (1985Re06).
274.5 3	2.5 8	1791.8	7$^-$	1517.3	5$^-$	E2&	0.1113	I$_{\gamma}$: 3.5 in (^{52}Cr,4nγ) (1994Mc06). A$_2$=+0.22 7; A$_4$=+0.02 9 (1985Re06).
305.6@ 2	100 10	462.5	4$^+$	156.7	2$^+$	E2b	0.0804	I$_{\gamma}$: 100 in (^{52}Cr,4nγ) (1994Mc06). A$_2$=+0.11 1; A$_4$=−0.02 2 (1985Re06).

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Gd(^{20}Ne,xnγ), ^{122}Sn(^{52}Cr,4nγ) 1994Mc06,1985Re06,1983Re03 (continued)

γ(^{170}W) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	α[f]	Comments
[x]308.6 *3*	3.5 *11*							A_2=+0.11 *10*, A_4=−0.02 *13* (1985Re06).
346.6 *3*	12 *3*	2898.4	(12⁻)	2551.8	(10⁻)	E2[&]	0.0558	I_γ: 15 in (^{52}Cr,4nγ) (1994Mc06). A_2=+0.32 *3*; A_4=−0.10 *4* (1985Re06).
348.4 *3*	5.1 *15*	2551.8	(10⁻)	2203.4	(8⁻)	Q		A_2=+0.10 *5*; A_4=−0.06 *7* (1985Re06).
361.8 *3*	14 *4*	2153.6	9⁻	1791.8	7⁻	E2[&]	0.0494	I_γ: 14 in (^{52}Cr,4nγ) (1994Mc06). A_2=+0.32 *3*; A_4=−0.12 *4* (1985Re06).
392.6 *3*	5.1 *15*	2203.4	(8⁻)	1810.8	(6⁻)	Q		A_2=+0.26 *5*; A_4=+0.02 *7* (1985Re06).
398.2 *3*	2.2 *7*	2551.8	(10⁻)	2153.6	9⁻	D		A_2=−0.34 *17* (1985Re06).
406.6 *3*	5.8 *17*	2610.0	(10⁻)	2203.4	(8⁻)			A_2=+0.23 *5*; A_4=+0.10 *6* (1985Re06).
413.2[c] *2*	99 *10*	875.7	6⁺	462.5	4⁺	E2[b]	0.0343	I_γ: 100 in (^{52}Cr,4nγ) (1994Mc06). A_2=+0.20 *1*; A_4=−0.05 *2* (1985Re06). I(25°)/I(90°)=1.21 *3* (1983Re03).
423.9 *3*	16 *5*	2577.5	11⁻	2153.6	9⁻	E2[&]	0.0321	I_γ: 19 in (^{52}Cr,4nγ) (1994Mc06). A_2=+0.32 *3*; A_4=−0.05 *4* (1985Re06).
428.4 *3*	5.3 *16*	1791.8	7⁻	1363.4	8⁺	D		I_γ: 3.5 in (^{52}Cr,4nγ) (1994Mc06). A_2=−0.25 *6*; A_4=+0.06 *7* (1985Re06).
432.9[c] *2*	34 *3*	3343.7	16⁺	2910.8	14⁺	E2[b]	0.0383	I_γ: 38 in (^{52}Cr,4nγ) (1994Mc06). A_2=+0.33 *2*; A_4=−0.03 *3* (1985Re06). I(25°)/I(90°)=1.52 *4* (1983Re03).
446.6[c] *2*	36 *4*	2910.8	14⁺	2464.2	12⁺	E2[b]	0.0280	I_γ: 47 in (^{52}Cr,4nγ) (1994Mc06). A_2=+0.34 *2*; A_4=−0.06 *3* (1985Re06). I(25°)/I(90°)=1.36 *4* (1983Re03).
456.1 *3*	11 *3*	3354.5	(14⁻)	2898.4	(12⁻)	Q		I_γ: 14 in (^{52}Cr,4nγ) (1994Mc06). A_2=+0.36 *4*; A_4=−0.11 *5* (1985Re06).
458.6 *3*	17 *5*	3036.0	13⁻	2577.5	11⁻	E2[&]	0.0261	I_γ: 19 in (^{52}Cr,4nγ) (1994Mc06). A_2=+0.29 *3*; A_4=−0.09 *4* (1985Re06).
484.4 *3*	6.8 *20*	3094.4	(12⁻)	2610.0	(10⁻)	Q		A_2=+0.37 *6*; A_4=−0.11 *10* (1985Re06).
487.9[c] *2*	82 *8*	1363.4	8⁺	875.7	6⁺	E2[b]	0.0223	I_γ: 80 in (^{52}Cr,4nγ) (1994Mc06). A_2=+0.32 *2*; A_4=−0.09 *3* (1985Re06). I(25°)/I(90°)=1.36 *3* (1983Re03).
501.5 *3*	16 *5*	3537.5	15⁻	3036.0	13⁻	Q		I_γ: 19 in (^{52}Cr,4nγ) (1994Mc06). A_2=+0.29 *4*; A_4=−0.04 *5* (1985Re06).
530.2[c] *2*	31 *3*	3873.9	18⁺	3343.7	16⁺	E2[b]	0.0182	I_γ: 38 in (^{52}Cr,4nγ) (1994Mc06). A_2=+0.35 *2*; A_4=−0.10 *3* (1985Re06). I(25°)/I(90°)=1.46 *5* (1983Re03).
532.3 *3*	8.7 *26*	3886.8	(16⁻)	3354.5	(14⁻)	Q		I_γ: 12 in (^{52}Cr,4nγ) (1994Mc06). A_2=+0.30 *6*; A_4=−0.14 *8* (1985Re06).
538.1[c] *2*	59 *6*	1901.5	10⁺	1363.4	8⁺	E2[b]	0.01753	I_γ: 70 in (^{52}Cr,4nγ) (1994Mc06). A_2=+0.32 *2*; A_4=−0.07 *3* (1985Re06). I(25°)/I(90°)=1.39 *3* (1983Re03).
557.1[d] *6*	13[d] *4*	4094.6	17⁻	3537.5	15⁻	Q		I_γ: 19 in (^{52}Cr,4nγ) (1994Mc06). A_2=+0.46 *4*; A_4=−0.13 *5* (1985Re06) for doublet dominated by this γ.
557.8[d] *6*	4.0[d] *12*	3652.2	(14⁻)	3094.4	(12⁻)			A_2=+0.46 *4*; A_4=−0.13 *5* (1985Re06) for doublet.
562.8[c] *2*	51 *5*	2464.2	12⁺	1901.5	10⁺	E2[b]	0.01573	I_γ: 51 in (^{52}Cr,4nγ) (1994Mc06). A_2=+0.35 *2*; A_4=−0.11 *3* (1985Re06). I(25°)/I(90°)=1.59 *4* (1983Re03).
573.5 *3*	7.5 *23*	4460.3	(18⁻)	3886.8	(16⁻)	Q		I_γ: 12 in (^{52}Cr,4nγ) (1994Mc06). A_2=+0.32 *4*; A_4=−0.13 *5* (1985Re06).
578.3[d] *3*	≈2[d]	4230.5	(16⁻)	3652.2	(14⁻)	Q		A_2=+0.35 *10* (1985Re06).
589.9 *6*		4684.5	19⁻	4094.6	17⁻			E_γ: from coincidence spectra (1985Re06). I(590γ+592γ)=23 in (^{52}Cr,4nγ) (1994Mc06).

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Gd(^{20}Ne,xnγ), ^{122}Sn(^{52}Cr,4nγ) 1994Mc06,1985Re06,1983Re03 (continued)

γ(^{170}W) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	α[f]	Comments
								Iγ=20.8 *21*, A_2=+0.36 *5*, A_4=−0.03 *6* (1985Re06) for 590γ+592γ (from coincidence spectra).
591.7 *6*		5276.2	21⁻	4684.5	19⁻			E_γ: from coincidence spectra (1985Re06). I(590γ+592γ)=23 in (^{52}Cr,4nγ) (1994Mc06). Iγ=20.8 *21*, A_2=+0.36 *5*, A_4=−0.03 *6* (1985Re06) for 590γ+592γ (from coincidence spectra).
596.4 *3*	6.2 *19*	5056.7	(20⁻)	4460.3	(18⁻)	Q		I_γ: 12 in (^{52}Cr,4nγ) (1994Mc06). A_2=+0.31 *7*; A_4=−0.08 *8* (1985Re06).
614.7[d] *6*	4.0[d] *12*	5671.4	(22⁻)	5056.7	(20⁻)			
616.5[c] *6*	28 *3*	4490.4	20⁺	3873.9	18⁺	E2[b]	0.01271	I_γ: 32 in (^{52}Cr,4nγ) (1994Mc06). A_2=+0.26 *4*; A_4=−0.13 *7* (1985Re06) for multiplet dominated by this γ. Iγ from coin spectrum. I(25°)/I(90°)=1.71 *6* (1983Re03).
618.4[d] *6*	6.8[d] *20*	5894.6	23⁻	5276.2	21⁻			
641.6[d] *6*	≈3[d]	1517.3	5⁻	875.7	6⁺			A_2=+0.23 *7*; A_4=−0.02 *10* (1985Re06).
653.7 *3*	6.7 *20*	3117.9	14⁺	2464.2	12⁺	Q		I_γ: 4.3 in (^{52}Cr,4nγ) (1994Mc06). A_2=+0.47 *9*; A_4=−0.12 *12* (1985Re06).
662.7 *3*	3.0 *9*	6334.1	(24⁻)	5671.4	(22⁻)	Q		A_2=+0.31 *6*; A_4=−0.14 *10* (1985Re06).
676.0 *3*	4.9 *15*	2577.5	11⁻	1901.5	10⁺	D		I_γ: 2.1 in (^{52}Cr,4nγ) (1994Mc06). A_2=−0.27 *8*; A_4=+0.06 *10* (1985Re06).
685.6 *3*	22.7 *23*	5176	22⁺	4490.4	20⁺	E2[a]	0.00999	I_γ: 23 in (^{52}Cr,4nγ) (1994Mc06). A_2=+0.35 *3*; A_4=−0.02 *4* (1985Re06). I(25°)/I(90°)=1.37 *7* (1983Re03).
693.0 *3*	4.1 *12*	6587.6	25⁻	5894.6	23⁻	Q		A_2=+0.34 *7* (1985Re06).
697.9 *3*	5.3 *16*	3815.8	16⁺	3117.9	14⁺	Q		I_γ: 4 in (^{52}Cr,4nγ) (1994Mc06). A_2=+0.37 *7* (1985Re06).
742.0 *3*	12 *4*	5918	24⁺	5176	22⁺	E2[a]		I_γ: 17 in (^{52}Cr,4nγ) (1994Mc06). A_2=+0.36 *5*; A_4=−0.04 *6* (1985Re06). I(25°)/I(90°)=1.51 *9* (1983Re03).
752[g] *1*	2.5 *8*	7086.1?	(26⁻)	6334.1	(24⁻)	Q		A_2=+0.44 *9*; A_4=−0.11 *12* (1985Re06).
771.6 *3*	4.0 *12*	7359.2	27⁻	6587.6	25⁻	(Q)		A_2=+0.27 *5*; A_4=−0.03 *6* (1985Re06).
790.2 *3*	11 *3*	2153.6	9⁻	1363.4	8⁺	E1		I_γ: 4.5 in (^{52}Cr,4nγ) (1994Mc06). Mult.: A_2=−0.29 *4*; A_4=+0.06 *5*; 90° polarization +0.26 *19* (1985Re06).
795.7 *3*	7.9 *24*	6713.7	26⁺	5918	24⁺	E2[a]		A_2=+0.31 *5*; A_4=−0.05 *6* (1985Re06). Iγ(25°)/Iγ(90°)=1.40 *10* (1983Re03).
840.1[d] *3*	5.1[d] *15*	2203.4	(8⁻)	1363.4	8⁺			
843[g] *1*	≈2	8202?	(29⁻)	7359.2	27⁻			
855.1[d] *3*	4.5[d] *14*	7568.8	28⁺	6713.7	26⁺	E2[a]		A_2=+0.36 *8* (1985Re06). Iγ(25°)/Iγ(90°)=1.53 *15* (1983Re03).
916.1 *3*	11 *3*	1791.8	7⁻	875.7	6⁺	E1		I_γ: 4.6 in (^{52}Cr,4nγ) (1994Mc06). Mult.: A_2=−0.23 *3*; A_4=+0.02 *5*; 90° polarization +0.39 *19* (1985Re06).
918.9[d] *3*	2.5[d] *8*	8487.7	30⁺	7568.8	28⁺	(Q)		A_2=+0.26 *8* (1985Re06). Iγ(25°)/Iγ(90°)=1.07 *20* (1983Re03).
935.1 *3*	3.4 *10*	1810.8	(6⁻)	875.7	6⁺			A_2=+0.23 *8*; A_4=+0.06 *10* (1985Re06).
943.5[e] *6*	5[e] *2*	9431.7	(32⁺)	8487.7	30⁺			
958.7[eg] *10*	3[e] *2*	10390.6?	(34⁺)	9431.7	(32⁺)			
979.6[eg] *10*	3[e] *2*	11370.2?	(36⁺)	10390.6?	(34⁺)			
[x]1039.7 *3*	≈2							

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Gd(^{20}Ne,xnγ), ^{122}Sn(^{52}Cr,4nγ) 1994Mc06,1985Re06,1983Re03 (continued)

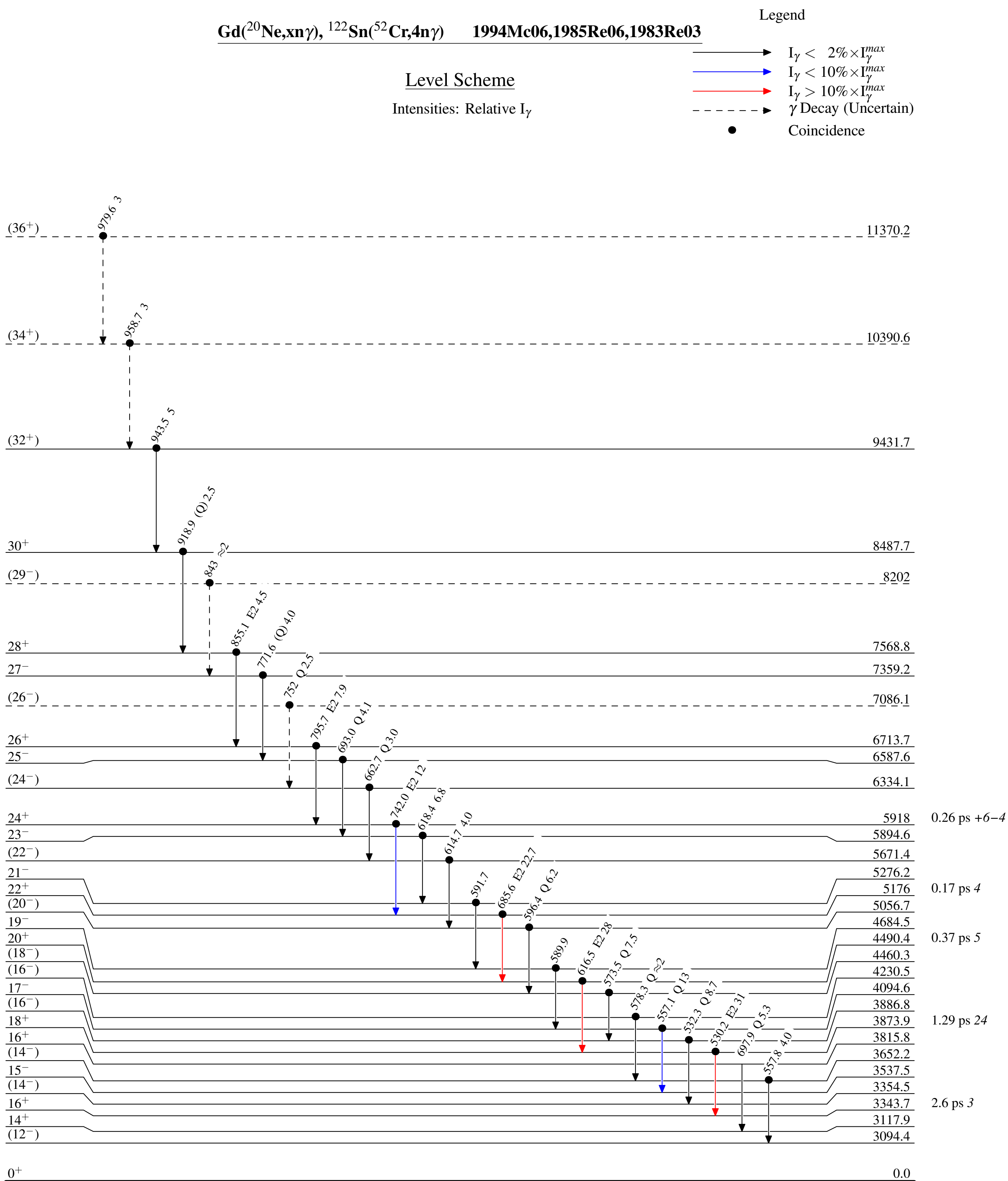
γ(^{170}W) (continued)

† From 1985Re06.
‡ Relative photon intensities from ^{154}Gd(^{20}Ne,4nγ) at E(^{20}Ne)=106.5 MeV, normalized so I(306γ)=100; from 1985Re06. ΔIγ=10% for strong lines, 30% for weak or multiple lines. For the purpose of assigning uncertainties, the evaluator has assumed that "strong" lines are those having Iγ>20. See comments on individual gammas for Iγ (uncertainty unstated) from (^{52}Cr,4nγ) (1994Mc06). Branching values deduced from 1985Re06 and 1994Mc06 are in poor agreement.
# From $\gamma(\theta)$ (1985Re06), except As noted. From the level scheme, multipolarities given As Q and D are E2 and E1, respectively.
@ From 1983Ar09.
& Q from $\gamma(\theta)$ in (^{20}Ne,xnγ); not M2 from RUL.
[a] Anisotropy≈1.4, consistent with stretched E2 multipolarity (1983Re03).
[b] $\gamma(\theta)$ consistent with stretched quadrupole; γ linear polarization (90°)=+0.4 to +0.6 (1985Re06); ce data confirm E2 (1983Re03).
[c] From 1983Re03.
[d] From coincidence spectra (1985Re06).
[e] Eγ from 1983Re03; Iγ from coin spectra at E(^{20}Ne)=120 MeV (1985Re06).
[f] 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.
[g] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

Gd(^{20}Ne,xnγ), ^{122}Sn(^{52}Cr,4nγ) 1994Mc06,1985Re06,1983Re03

Level Scheme

Intensities: Relative I_γ

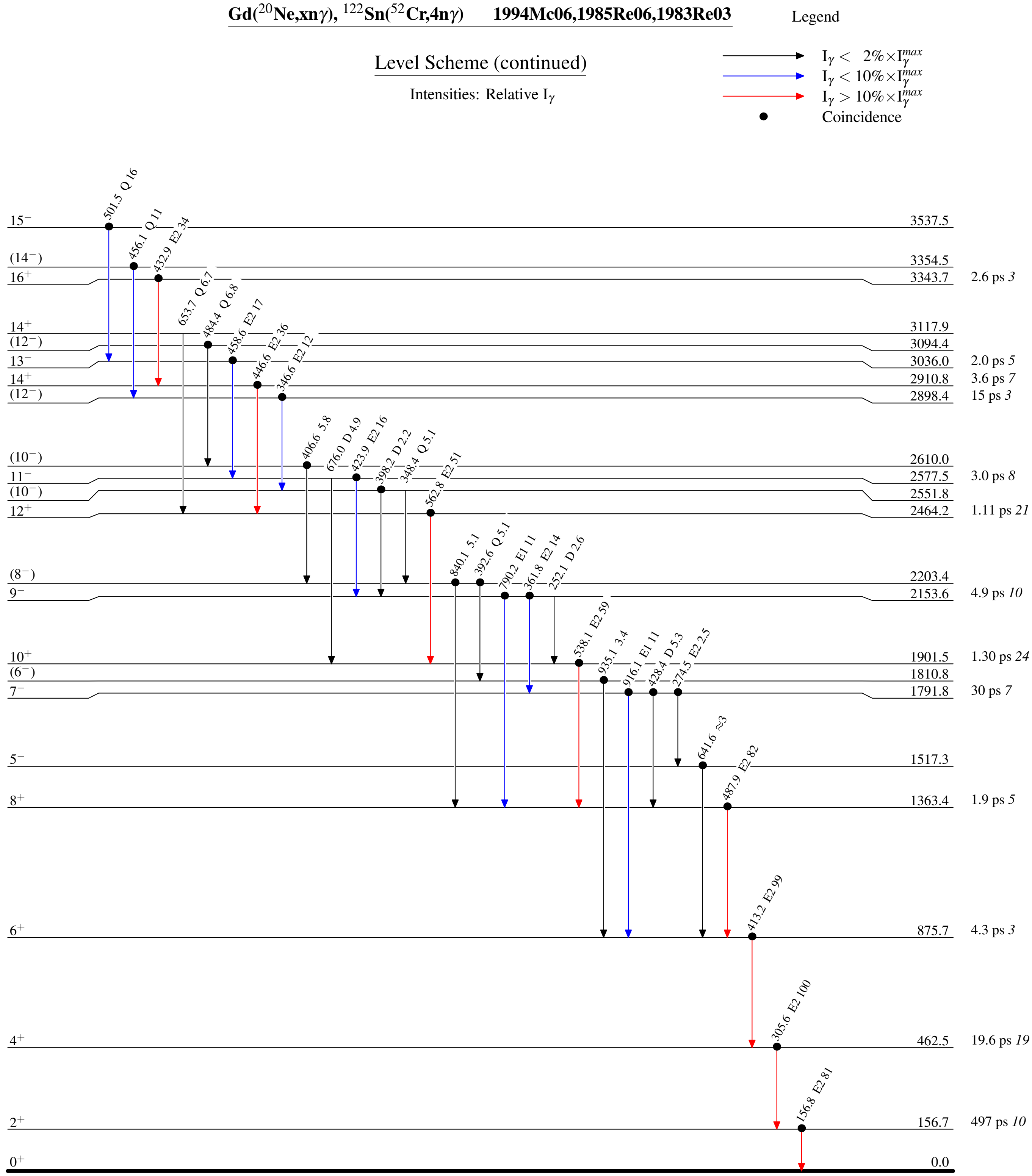


$^{170}_{74}W_{96}$

Gd(^{20}Ne,xnγ), ^{122}Sn(^{52}Cr,4nγ) 1994Mc06,1985Re06,1983Re03

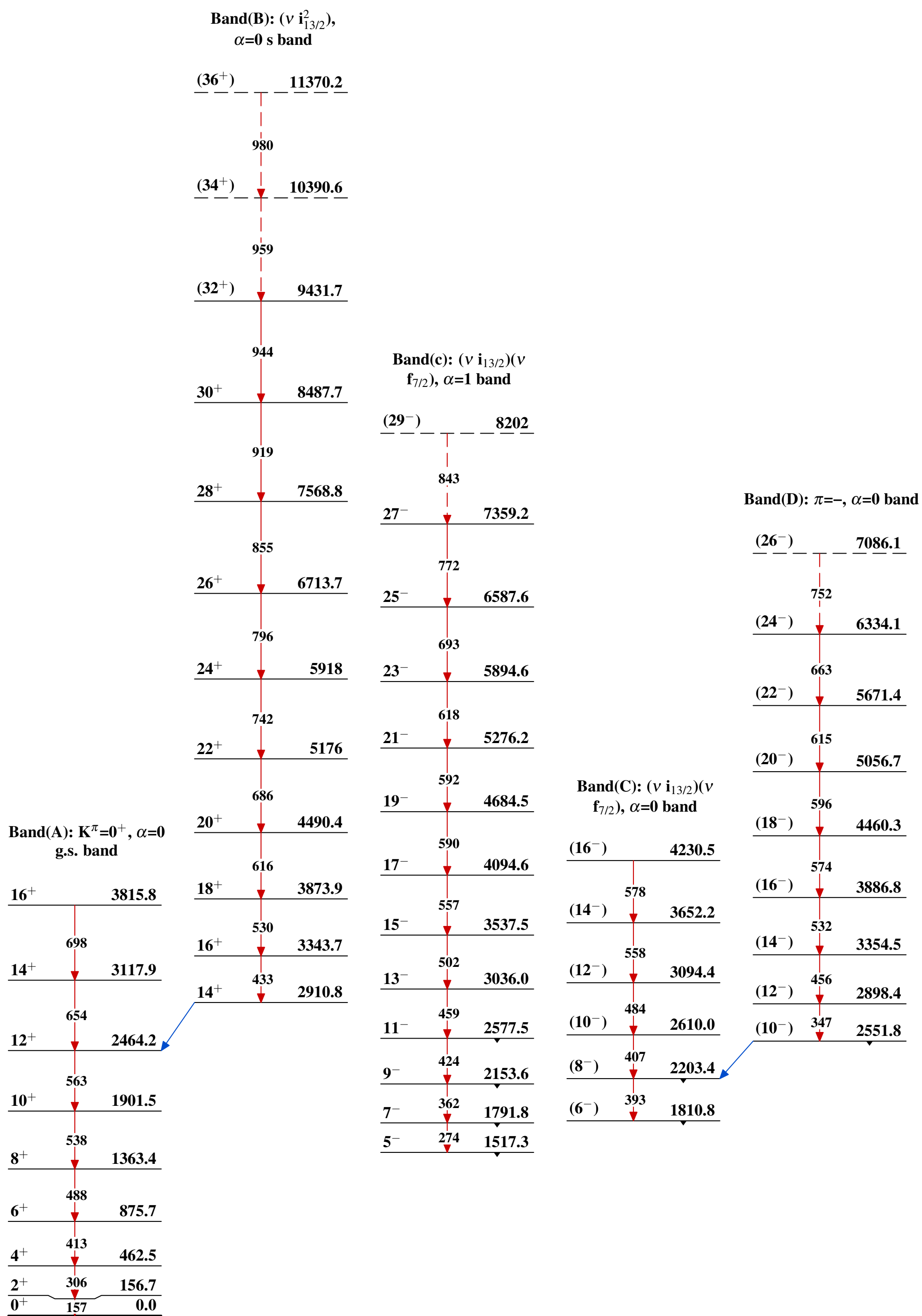
Level Scheme (continued)

Intensities: Relative I_γ



$^{170}_{74}W_{96}$

Gd(^{20}Ne,xnγ), ^{122}Sn(^{52}Cr,4nγ) 1994Mc06,1985Re06,1983Re03



$^{170}_{74}W_{96}$