^{122}Sn(^{13}C,3nγ) 1989Pa17

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Yu. Khazov, A. A. Rodionov and S. Sakharov, Balraj Singh	NDS 104, 497 (2005)	10-Feb-2005

1989Pa17: E=57 MeV. Measured Eγ, Iγ, $\gamma\gamma$, $\gamma(\theta)$, $\gamma\gamma(\theta)$ using an array of five Ge detectors, each surrounded by BGO anti-Compton shield, and a multiplicity filter of 16 BGO detectors.

Others:

1996Ko16: E=53 MeV. Measured lifetimes by $\gamma\gamma$(t); generalized centroid-shift method.

1988De01: E=53 MeV. Measured lifetime of 10^+ isomer.

^{132}Ba Levels

E(level)	J$^\pi$†	T$_{1/2}$	Comments
0.0@	0^+		
464.59@ *16*	2^+		
1032.01& *16*	2^+		
1127.91@ *20*	4^+		
1511.34& *19*	3^+		
1729.91& *19*	4^+		
1932.49@ *22*	6^+		
2027.42 *21*	4^-		
2120.18[a] *21*	5^-	0.40 ns *+20−10*	T$_{1/2}$: from $\gamma\gamma$(t) (1996Ko16).
2241.36& *21*	6^+		
2313.0 *3*			
2358.15[a] *22*	6^-		
2423.30 *23*	6^-		
2483.69[a] *22*	7^-	<0.2 ns	T$_{1/2}$: from $\gamma\gamma$(t) (1996Ko16).
2718.60 *23*	7^-		
2800.82@ *23*	8^+		
2867.66 *24*	8^+		
2901.67[a] *25*	8^-		
3095.2 *3*	8^-		
3116.7@ *3*	10^+	8.7 ns *2*	T$_{1/2}$: from γ(t) (1989Pa17). Other: 7.5 ns *6* (1988De01).
3122.9 *3*			
3189.0[a] *3*	9^-		
3340.68[b] *23*	9^-		
3599.3 *3*	10^+		
3678.8 *3*	10^+		
3906.6 *4*			
3916.2@ *4*	12^+		
3951.0[b] *3*	11^-		
3965.9? *11*			
4062.1[a] *4*	11^-		
4108.8‡[c] *11*	(10^+)‡		
4312.6‡[c] *11*	(11^+)‡		
4362.8 *3*	12^+		
4525.2?[a] *11*	13^-		E(level): ordering of 759-463 cascade is reversed In 1995Ju09, which gives the intermediate level At 4820 instead of 4525.
4548.3‡[c] *11*	(12^+)‡		
4712.0[b] *4*	13^-		
4805.7@ *4*	14^+		

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^{122}Sn(^{13}C,3nγ) 1989Pa17 (continued)

^{132}Ba Levels (continued)

E(level)	J^π[†]	E(level)	J^π[†]	E(level)	J^π[†]	E(level)	J^π[†]
4864.1[#d] *5*	(11⁻)[#]	5283.7[a] *11*	15⁻	5836.2[@] *5*	16⁺	6956.2[@] *11*	18⁺
4883.3[‡c] *11*	(13⁺)[‡]	5307.8[‡c] *11*	(14⁺)[‡]	5964.3[#d] *11*	(15⁻)[#]	7239.7[a] *11*	(19⁻)
5033.8[#d] *4*	(12⁻)[#]	5540.5 *4*		6295.7[a] *11*	(17⁻)		
5085.8 *4*		5557.3[#d] *5*	(14⁻)[#]	6373.8 *5*			
5249.4[#d] *5*	(13⁻)[#]	5574.5[b] *5*	15⁻	6485.3[b] *5*	17⁻		

[†] As assigned by 1989Pa17. The assignments are the same as in Adopted Levels, except that parentheses have been added by the evaluators in the Adopted Levels when strong arguments are lacking.

[‡] The 425-335-236-204 cascade is confirmed by 1995Ju09 and extended by one transition below and two At the top. However, due to different connecting transitions found by 1995Ju09, the level energies and spins (In 1995Ju09) are higher by 888 keV and 2 units of spin, respectively. For example 4109, (10⁺) level In 1989Pa17 corresponds to 4997, 12⁺ level In 1995Ju09.

[#] The 407-308-216-170 cascade is confirmed by 1995Ju09 and extended by one transition At the top. However, due to different connecting transitions found by 1995Ju09, the level energies and spins (In 1995Ju09) are higher by 857 keV and 3 units of spin, respectively. For example 4864, (11⁻) level In 1989Pa17 corresponds to 5721, 14⁻ level In 1995Ju09.

[@] Band(A): Yrast band.

[&] Band(B): γ-vibrational band.

[a] Band(C): Two-quasineutron band.

[b] Band(D): Two-quasiproton band.

[c] Band(E): ΔJ=1 band. Possibly a dipole magnetic-rotational structure.

[d] Band(F): ΔJ=1 band possibly a dipole magnetic-rotational structure.

γ(^{132}Ba)

E_γ	I_γ	E_i(level)	J^π_i	E_f	J^π_f	Mult.[†]	δ	α[&]	Comments
125.5 *2*	2.5 *3*	2483.69	7⁻	2358.15	6⁻	D+Q	≈−0.2		A_2=−0.51 *4*, A_4=+0.14 *7*. DCO=0.43 *7*.
169.7 *2*	0.9 *2*	5033.8	(12⁻)	4864.1	(11⁻)				DCO=1.0 *2*
187.7 *2*	0.9 *2*	2120.18	5⁻	1932.49	6⁺	D			DCO=0.64 *10*
203.8 *2*	1.0 *2*	4312.6	(11⁺)	4108.8	(10⁺)	D+Q			DCO=0.5 *1*
215.6 *2*	2.9 *1*	5249.4	(13⁻)	5033.8	(12⁻)	D+Q			DCO=0.59 *6*
235.7 *2*	1.0 *3*	4548.3	(12⁺)	4312.6	(11⁺)	D+Q			DCO=0.5 *1*
237.9 *2*	4.7 *2*	2358.15	6⁻	2120.18	5⁻	D+Q	≈−0.2		A_2=−0.73 *8*, A_4=+0.24 *11*. DCO=0.42 *2*.
242.4 *2*	4.5 *2*	2483.69	7⁻	2241.36	6⁺	D			A_2=−0.43 *7*, A_4=+0.09 *10*. DCO=0.61 *4*.
245.6 *2*	<1	3340.68	9⁻	3095.2	8⁻				
249.1 *2*	1.4 *1*	3116.7	10⁺	2867.66	8⁺	(E2)		0.0830	α(K)=0.0663 *20*; α(L)=0.0132 *4*; α(M)=0.00278 *9*; α(N+..)=0.00073 *2*
285.6 *2*	2.7 *2*	2313.0		2027.42	4⁻	D			DCO=0.67 *5*
287.5 *2*	1.5 *2*	3189.0	9⁻	2901.67	8⁻	D+Q			DCO=0.47 *7*
295.1 *2*	2.0 *2*	2718.60	7⁻	2423.30	6⁻	D+Q			A_2=−0.62 *10*, A_4=+0.08 *13*. DCO=0.39 *4*.
303.2 *2*	2.7 *2*	2423.30	6⁻	2120.18	5⁻	D+Q			A_2=−0.81 *7*, A_4==0.09 *9*. DCO=0.23 *4*.
307.9 *2*	2.6 *1*	5557.3	(14⁻)	5249.4	(13⁻)	D+Q			A_2=−0.38 *10*, A_4=−0.07 *13*. DCO=0.65 *7*.
315.9 *2*	29.0 *3*	3116.7	10⁺	2800.82	8⁺	E2		0.0385	α(K)=0.0315 *10*; α(L)=0.00558 *17*; α(M)=0.00117 *4*; α(N+..)=0.00031 *1* A_2=+0.19 *5*, A_4=−0.02 *7*. DCO=1.05 *2*.
330.8 *2*	1.1 *1*	2358.15	6⁻	2027.42	4⁻				
335.0 *2*	1.2 *2*	4883.3	(13⁺)	4548.3	(12⁺)	D+Q			DCO=0.4 *1*
360.5 *2*	<1	2718.60	7⁻	2358.15	6⁻				
363.5 *2*	15.5 *2*	2483.69	7⁻	2120.18	5⁻	E2		0.0249	α(K)=0.0206 *7*; α(L)=0.00344 *11*; α(M)=0.00072 *2*; α(N+..)=0.00019 *1* A_2=+0.05 *5*, A_4==0.01 *7*. DCO=1.07 *4*.

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^{122}Sn(^{13}C,3nγ) 1989Pa17 (continued)

$\gamma(^{132}$Ba) (continued)

E_γ	I_γ	E_i(level)	J^π_i	E_f	J^π_f	Mult.[†]	Comments
377 1	1.3 2	3095.2	8^-	2718.60	7^-	D+Q	A_2=−0.59 7, A_4=+0.03 9. DCO=0.28 4.
390.2 2	15.9 3	2120.18	5^-	1729.91	4^+	D	A_2=−0.21 5, A_4=−0.05 6. DCO=0.70 5.
395.7 2	2.2 2	2423.30	6^-	2027.42	4^-	Q	DCO=1.20 16
407 1	1.0 1	5964.3	(15^-)	5557.3	(14^-)	D+Q	DCO=0.68 13
417.5 2	4.9 2	2901.67	8^-	2483.69	7^-	D+Q	DCO=0.30 2
424.5 2	1.1 2	5307.8	(14^+)	4883.3	(13^+)	D+Q	DCO=0.5 1
438.4 2	1.8 2	3340.68	9^-	2901.67	8^-	D+Q	DCO=0.77 11 E_γ: level-energy difference=439.0.
454.7 2	1.8 2	5540.5		5085.8		D	DCO=0.57 17
463[@] 1	<8	4525.2?	13^-	4062.1	11^-		I_γ: 100 for 463+464.6.
464.6 2	100	464.59	2^+	0.0	0^+	Q	I_γ: for 464.4+463; <8 units assigned to 463γ. A_2=+0.24 6, A_4=−0.03 6 for doublet. DCO=1.06 2.
479.3 2	4.8 2	1511.34	3^+	1032.01	2^+	D+Q	A_2=+0.15 10, A_4=+0.03 8. DCO=0.98 9.
511.5 2	8.8 2	2241.36	6^+	1729.91	4^+	(Q)	DCO=0.89 6
516.0 2	3.8 2	2027.42	4^-	1511.34	3^+	D	DCO=0.54 8
537.5 2	2.1 2	6373.8		5836.2	16^+	(D+Q)	I_γ: for 537.5+539.8. A_2=−0.10 18 (A_4 set to 0), DCO=0.42 9 for 537.5+539.8.
539.8 2	2.1 2	3340.68	9^-	2800.82	8^+	D	I_γ: for 539.8+537.5. A_2=−0.10 18 (A_4 set to 0), DCO=0.42 9 for 539.8+537.5.
559.6 2	1.8 1	2800.82	8^+	2241.36	6^+	(Q)	DCO=0.77 16
567.4 2	11.2 2	1032.01	2^+	464.59	2^+	D+Q[‡]	A_2=−0.03 6, A_4=+0.03 8. DCO=0.81 4.
598.5 2	4.2 2	2718.60	7^-	2120.18	5^-	Q	DCO=1.21 7
602.0 2	3.2 2	1729.91	4^+	1127.91	4^+	D+Q[‡]	DCO=0.66 4
610.3 2	7.6 3	3951.0	11^-	3340.68	9^-	Q	DCO=1.06 7
622.0 2	2.1 2	3340.68	9^-	2718.60	7^-		
626.2 2	1.9 1	2867.66	8^+	2241.36	6^+	Q	A_2=+0.39 8, A_4=+0.02 9. DCO=1.27 20.
632[#a] 1	<1	4548.3	(12^+)	3916.2	12^+		
663.4 2	75.9 12	1127.91	4^+	464.59	2^+	Q	A_2=+0.32 6, A_4=−0.03 6. DCO=1.02 2.
672.0 2	0.9 1	3095.2	8^-	2423.30	6^-	Q	DCO=1.22 16
683.9 2	1.7 2	4362.8	12^+	3678.8	10^+	(Q)	A_2=+0.24 6, A_4=−0.05 7. DCO=1.7 6.
697.9 2	8.3 2	1729.91	4^+	1032.01	2^+	Q	A_2=+0.21 6, A_4=−0.02 7. DCO=1.16 17.
705.2 2	12.3 5	3189.0	9^-	2483.69	7^-	Q	A_2=+0.31 6, A_4=−0.02 7. DCO=1.08 6.
731.5 2	0.8 1	3599.3	10^+	2867.66	8^+	(Q)	DCO=1.00 22
734.9 2	1.6 2	5540.5		4805.7	14^+	D+Q	DCO=0.34 10
758.5[@] 2	7.5 2	5283.7	15^-	4525.2?	13^-	Q	A_2=+0.38 8, A_4=−0.09 9. DCO=1.02 6.
761.0 2	3.8 4	4712.0	13^-	3951.0	11^-	Q	α(K)=0.00287; α(L)=0.00039 DCO=1.25 15
763.5 2	3.1 3	4362.8	12^+	3599.3	10^+	Q	DCO=1.05 13
789.9 2	2.6 2	3906.6		3116.7	10^+	D+Q	A_2=−0.81 8, A_4==0.11 11. DCO=0.18 3.
798.8 2	≈3	3599.3	10^+	2800.82	8^+		
799.5 2	≈20	3916.2	12^+	3116.7	10^+	Q	I_γ: 22.8 4 for 799.5+798.8. A_2=+0.25 6, A_4=−0.08 7, DCO=0.94 2 for 799.5+798.8.
801[a] 1	<1	4864.1	(11^-)	4062.1	11^-		E_γ: γ not reported by 1995Ju09.
804.5 2	53.6 9	1932.49	6^+	1127.91	4^+	Q	A_2=+0.30 6, A_4=−0.03 7. DCO=1.01 2.
811.0 2	1.7 2	3678.8	10^+	2867.66	8^+	Q	DCO=0.93 12
834 1	<1	6373.8		5540.5			
843[a] 1	<1	3965.9?		3122.9			E_γ: γ not seen by 1995Ju09.
857.6 2	1.6 1	3340.68	9^-	2483.69	7^-	(Q)	E_γ: level-energy difference=857.0. A_2=+0.57 14 (A_4 set to 0). DCO=1.01 16.
862.5 2	2.5 1	5574.5	15^-	4712.0	13^-	(Q)	DCO=0.90 13
868.4 2	33.1 6	2800.82	8^+	1932.49	6^+	Q	A_2=+0.32 6, A_4=−0.03 7. DCO=1.07 2.
873.1 2	8.6 2	4062.1	11^-	3189.0	9^-	Q	A_2=+0.32 7, A_4=+0.02 7. DCO=1.08 6.
879[a] 1	<1	3678.8	10^+	2800.82	8^+		placement of an 880.5 from 5321, 14^- level In 1995Ju09.
889.5 2	9.2 2	4805.7	14^+	3916.2	12^+	Q	A_2=+0.38 7, A_4=−0.11 8. DCO=0.96 4.

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^{122}Sn(^{13}C,3nγ) 1989Pa17 (continued)

γ(^{132}Ba) (continued)

E_γ	I_γ	E_i(level)	J^π_i	E_f	J^π_f	Mult.[†]	Comments
899.5 *2*	3.4 *1*	2027.42	4⁻	1127.91	4⁺	D[‡]	A_2=+0.27 *6*, A_4=−0.05 *7*. DCO=0.62 *8*.
910.8 *2*	0.9 *1*	6485.3	17⁻	5574.5	15⁻	(Q)	DCO=1.1 *4*
935.0 *2*	8.4 *4*	2867.66	8⁺	1932.49	6⁺	Q	A_2=+0.37 *10*, A_4=−0.22 *12*. DCO=1.08 *6*.
944.0 *2*	2.2 *3*	7239.7	(19⁻)	6295.7	(17⁻)	(Q)	DCO=1.07 *22*
949[#] *1*	1.8 *2*	4548.3	(12⁺)	3599.3	10⁺	Q	DCO=1.04 *12*
971.7 *2*	3.9 *2*	5033.8	(12⁻)	4062.1	11⁻	D	according to 1995Ju09, this transition does not deexcite ΔJ=1 band member, instead, it deexcites a 13⁻ level At 5033. However, γ(θ) and γγ(θ) data imply a ΔJ=1 transition, which is inconsistent with ΔJ=2 transition implied by γγ(θ) data of 1995Ju09. A_2=−0.06 *7*, A_4=−0.06 *9*. DCO=0.79 *9*.
992[a] *1*	≈1	4108.8	(10⁺)	3116.7	10⁺		E_γ: γ not reported by 1995Ju09.
992.4 *2*	14.1 *3*	2120.18	5⁻	1127.91	4⁺	D	I_γ: for 992.4+992. A_2=−0.22 *6*, A_4=−0.01 *8* for 992.4+992. DCO=0.61 *3*.
1012.0 *2*	3.3 *3*	6295.7	(17⁻)	5283.7	15⁻	(Q)	DCO=0.92 *15*
1030.5 *2*	5.5 *2*	5836.2	16⁺	4805.7	14⁺	Q	I_γ: for 1032.0+1030.5. A_2=+0.14 *8*, A_4=+0.03 *11* for 1032.0+1030.5. DCO=1.08 *11*.
1032.0 *2*	5.5 *2*	1032.01	2⁺	0.0	0⁺	(Q)	I_γ: for 1032.0+1030.5. A_2=+0.14 *8*, A_4=+0.03 *11* for 1032.0+1030.5. DCO=1.4 *2*.
1046.7 *2*	3.4 *3*	1511.34	3⁺	464.59	2⁺	D+Q	A_2=+0.11 *7*, A_4=−0.03 *9*. DCO=1.04 *10*.
1113.5 *2*	5.9 *1*	2241.36	6⁺	1127.91	4⁺	Q	DCO=0.98 *7*
1120 *1*	4.4 *2*	6956.2	18⁺	5836.2	16⁺	(Q)	A_2=+0.25 *7* (A_4 set to 0).
1169.5 *2*	1.6 *2*	5085.8		3916.2	12⁺	D	DCO=0.76 *9*
1190.4 *2*	0.7 *1*	3122.9		1932.49	6⁺		DCO=1.0 *3*
1265.3 *2*	4.2 *2*	1729.91	4⁺	464.59	2⁺	Q	A_2=+0.36 *10*, A_4=−0.04 *12*. DCO=1.04 *9*.

[†] From γ(θ) and γγ(θ); mult=Q corresponds to stretched quadrupole (ΔJ=2) transition; D or D+Q mostly to ΔJ=1 transition, but in three cases to ΔJ=0 transition. Based on band structures and systematics of yrast population of states in high-spin structures,1989Pa17 assign E2 to mult=Q; E1 to mult=D in cases where Δ(J^π) is given; and M1/E2 to mult=D+Q.

[‡] ΔJ=0 transition.

[#] According to 1995Ju09, this transition does not deexcite ΔJ=1 band member, instead, it deexcites a 12⁺ level At 4548.

[@] Ordering of 759-463 cascade is reversed In 1995Ju09; 463γ from 5283 level and 759 from 4820 level.

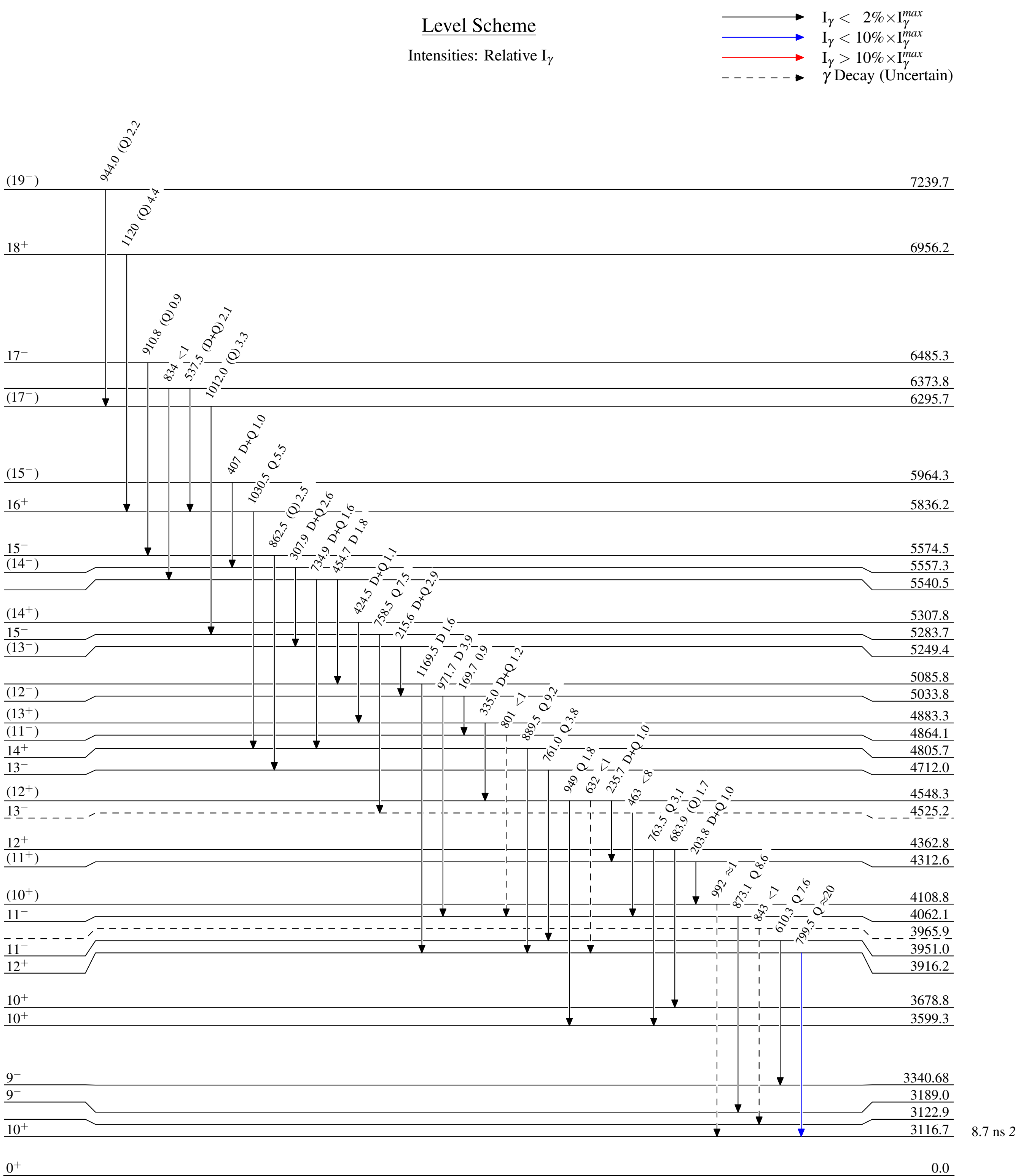
[&] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

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

$^{122}Sn(^{13}C,3n\gamma)$ 1989Pa17

Level Scheme

Intensities: Relative I_γ



$^{132}_{56}Ba_{76}$

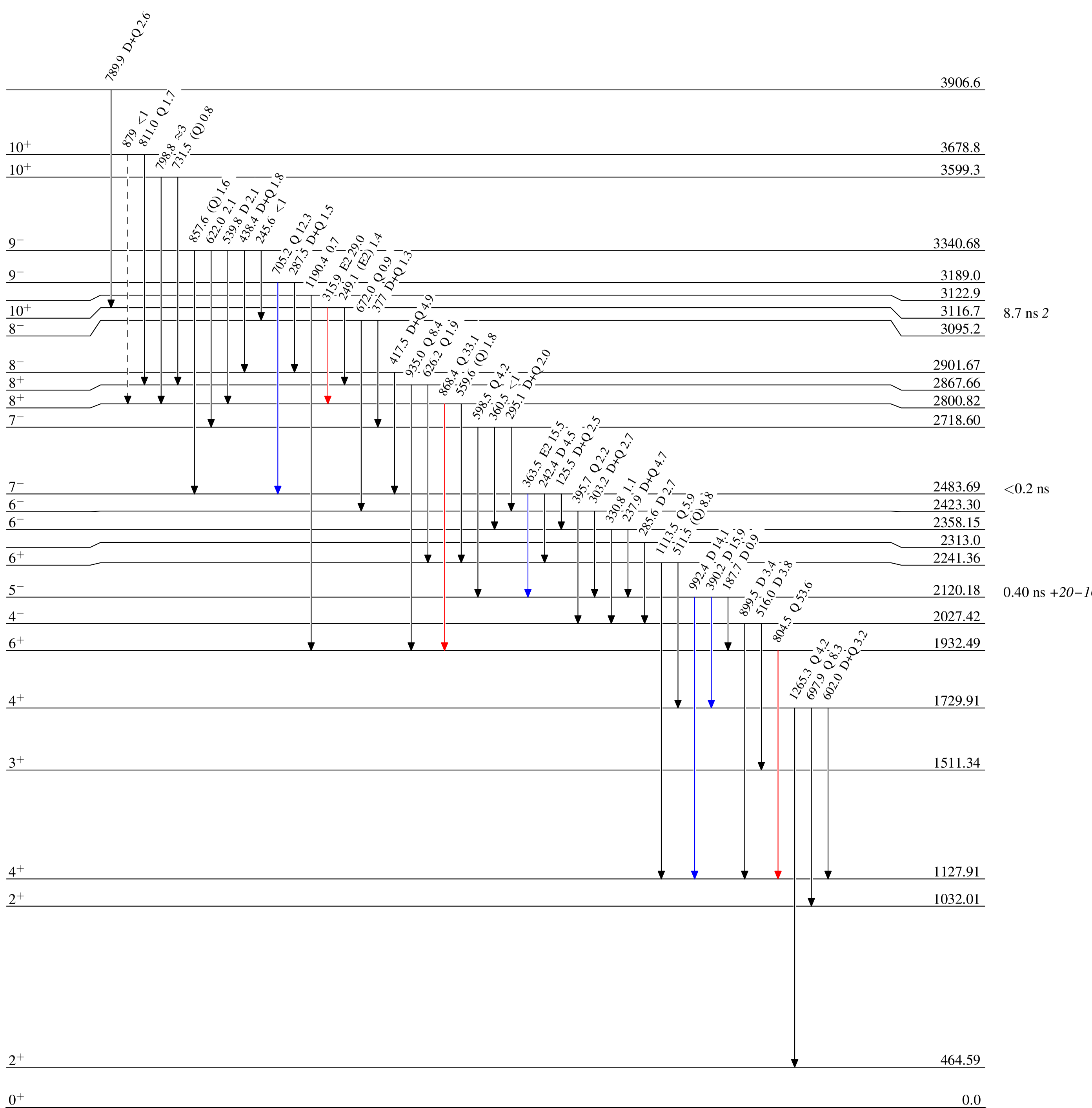
$^{122}Sn(^{13}C,3n\gamma)$ 1989Pa17

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)



$^{132}_{56}Ba_{76}$

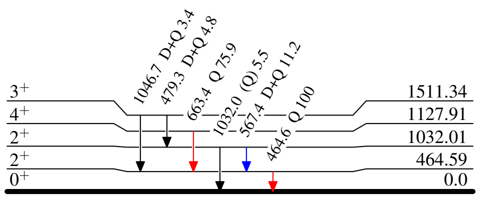
$^{122}Sn(^{13}C,3n\gamma)$ 1989Pa17

Level Scheme (continued)

Intensities: Relative I_γ

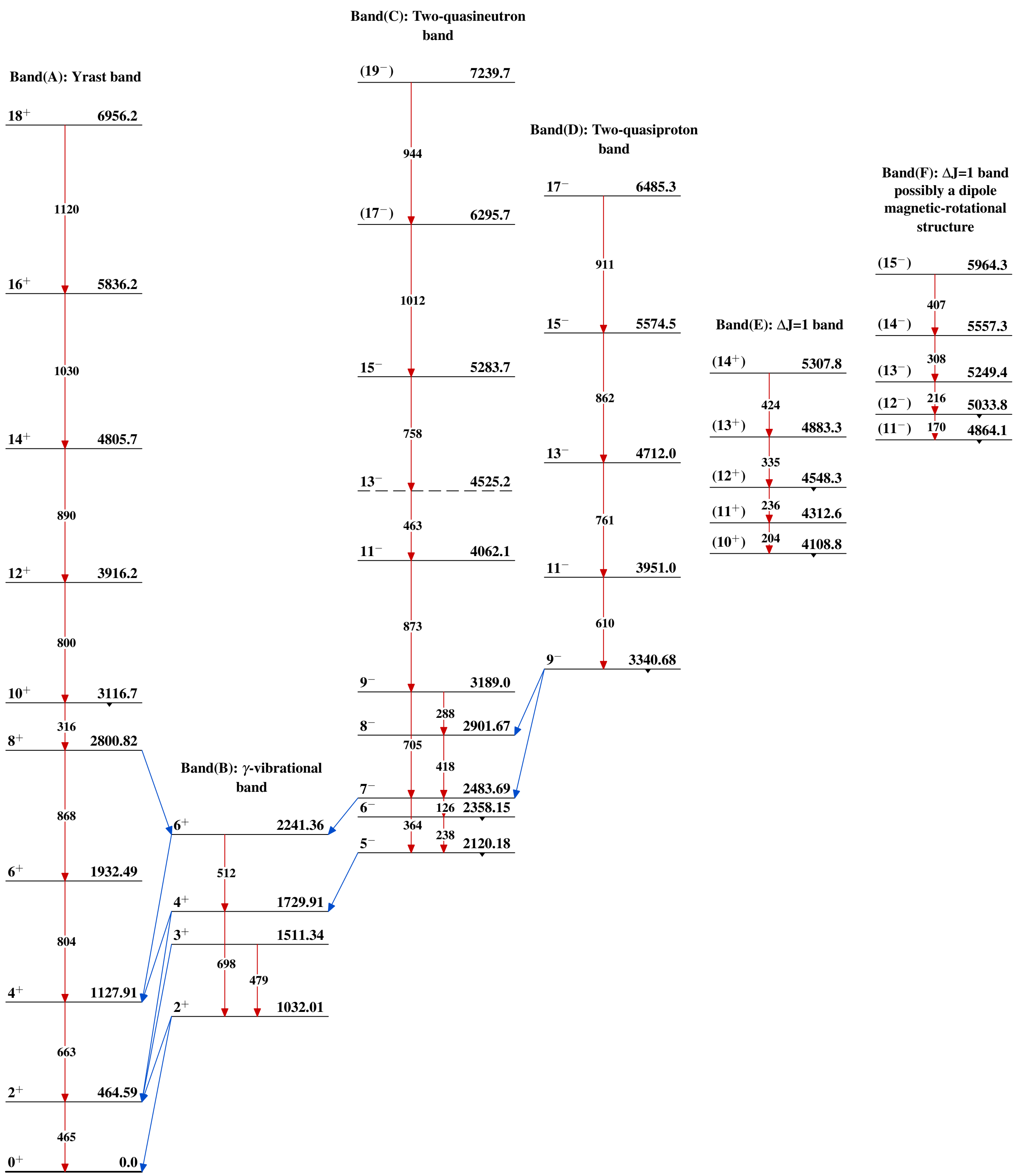
Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$



$^{132}_{56}Ba_{76}$

$^{122}Sn(^{13}C,3n\gamma)$ 1989Pa17



$^{132}_{56}Ba_{76}$