^{209}Bi(n,n′γ) 1984Pr08,1996De48,2008Mi01

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	J. Chen # and F. G. Kondev	NDS 126, 373 (2015)	30-Sep-2013

1984Pr08: E=reactor fast neutrons were produced from the McMaster University Reactor. Targets were cylindrical samples of ^{209}Bi, 3.5 cm in diam. and 2.5 cm in length. γ-rays were detected by a spectrometer of a 28 cm^3 intrinsic Ge detector surrounded by a quadrisected annulus of NaI detector of 15 cm long. Measured Eγ, Iγ. Deduced levels, J^π, excitation probabilities.

1996De48: E=1.510-4.335 MeV neutrons were produced by the ^{7}Li(p,n) and D(d,n) reactions with the pulsed proton beams from the 7 MV Van de Graaff accelerator of the Laboratori Nazionali di Legnaro. Target was 209 g ^{209}Bi. γ-rays were detected by a true coaxial HPGe detector. Measured Eγ, Iγ, γ(t), σ(θ). Deduced levels, J^π, $T_{1/2}$.

2008Mi01: E=threshold−20 MeV neutrons were produced from the Gelina facility. Target is 99.5% enriched ^{209}Bi. γ-rays were detected by two large volume HPGe detectors at 110° and 150°. Measured Eγ, Iγ, σ. Deduced levels, branching ratios.

Others:
1961Gr34 (E=2.95 MeV), 1968Wi24 (E=1.8-2.5 MeV), 1971De46 (E=0.6-3.8 MeV), 1975De36 (E=14.7 MeV), 1977Di12 (E=5.4 MeV), 1982Wu02 (E=14.2 MeV), 1994Ch57 (E=radioactive),

^{209}Bi Levels

E(level)†	J^π@	$T_{1/2}$	Comments
0	9/2$^-$		J^π: from Adopted Levels.
896.16 *5*	(7/2$^-$)		
1608.57 *7*	(13/2$^+$)		
2442.84 *11*	(1/2$^+$)	11.3 ns *4*	$T_{1/2}$: from 1546.7γ(t) (1996De48).
2493.02 *10*	(3/2$^+$)		
2564.12 *10*	(9/2)$^+$		
2583.04 *8*	(9/2)$^+$		
2599.92 *10*	(11/2$^+$)		
2601.17 *12*	(13/2$^+$,15/2$^+$)		
2617.37 *8*	(5/2$^+$)		
2741.20 *8*	(15/2$^+$)		
2766.89 *19*	(3/2$^+$)		
2826.14 *15*	(5/2$^-$)		
2845.9 *4*	(1/2$^+$)		
2917.6 *6*	(5/2$^+$)		
2955.85 *24*	(3/2$^+$)		
2986.9 *5*	(21/2$^-$)	17.9 ns *5*	$T_{1/2}$: from 1132.7γ(t) and 2741.1γ(t) from E=2741 level fed by 245.7γ (1996De48).
3039.07 *12*	(5/2$^+$)		
3089.95 *9*	(9/2$^+$)		
3119.4 *5*	(3/2$^-$)		
3133.03 *10*	(13/2$^+$)		
3135.88 *12*	(15/2$^+$)		
3152.73 *10*	(9/2$^+$)		
3154.6 *5*	(17/2$^+$,19/2$^+$)		
3159.3#			
3169.28 *12*	(11/2$^+$)		
3197.4#			
3211.9#			
3221.7 *4*	(7/2$^+$)		
3269.6#			
3310.75 *8*	(9/2$^+$)		
3354.8#			
3361.88 *12*	(3/2$^+$)		
3378.14 *9*	(9/2$^+$)		
3394.48‡ *12*	(17/2$^+$)		

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^{209}Bi(n,n′γ) 1984Pr08,1996De48,2008Mi01 (continued)

^{209}Bi Levels (continued)

E(level)†	Jπ@	E(level)†	E(level)†
3394.90‡ *11*	(7/2+,9/2+)	4096.34 *17*	4837.6 *3*
3406.28 *12*	(11/2+)	4134.0 *20*	4853.46 *20*
3450.18 *21*	(3/2−)	4148.10 *15*	4879.37 *19*
3464.13 *10*	(9/2+)	4158.78 *19*	4948.2 *5*
3468.0 *9*		4160.9 *7*	4967.6 *15*
3489.58 *17*	(9/2−)	4176.14 *10*	4996.2 *3*
3502.2#		4207.5 *4*	5056.7 *6*
3505.13 *20*	5/2−,7/2−	4222.9 *7*	5167.3 *3*
3541.73 *19*	(5/2−)	4233.75 *20*	5182.7 *7*
3574.88 *21*	(7/2+)	4262.95 *20*	5235.1 *3*
3579.0#		4297.69 *17*	5281.9 *11*
3597.1#		4300.75 *10*	5293.4 *6*
3601.58 *11*	(9/2+,11/2+)	4335.3 *3*	5312.6 *13*
3692.14 *10*	(11/2−)	4340.7 *5*	5354.0 *4*
3702.34?‡ *10*	(11/2+)	4361.89 *21*	5404.5 *6*
3703.2‡ *6*	(7/2+,9/2)	4376.5 *6*	5411.2 *6*
3717.64 *10*	(5/2+)	4381.19 *21*	5424.62 *25*
3752.1 *3*		4388.04 *19*	5440.2 *10*
3766.9 *3*	(5/2+)	4397.85 *20*	5464.6 *8*
3782.98 *12*	(7/2+,9/2+)	4409.05 *20*	5484.4 *5*
3800.71 *15*	(11/2+)	4441.7 *10*	5498.0 *10*
3817.85 *21*	(11/2+,13/2+)	4471.0 *3*	5510.53 *25*
3849.94 *20*	(7/2−)	4484.79 *12*	5523.4 *5*
3884.3 *5*		4506.85 *20*	5538.3 *7*
3889.5 *3*	(5/2+)	4515.22 *11*	5559.5 *6*
3905.8 *3*	(9/2+,11/2+)	4587.9 *6*	5570.6 *7*
3921.22 *10*	(9/2+,11/2+)	4602.6 *13*	5589.2 *7*
3936.74 *10*	(7/2−)	4646.1 *3*	5609.7 *3*
3962.21 *22*	(9/2−)	4681.9 *8*	5652.6 *8*
3980.04 *10*	(9/2−,11/2−)	4750.71 *17*	5925.1 *17*
4000.71 *15*	(11/2−)	4755.76 *20*	6944.8 *21*
4009.3 *4*		4762.2 *3*	7176.6 *10*
4036.5 *4*		4789.8 *4*	7243.9 *13*
4046.54 *20*		4796.1 *3*	
4088.34 *10*		4830.3 *3*	

† From a least-squares fit to γ-ray energies.
‡ Doublets at E=3395 and E=3702 proposed by 1996De48. The authors state that the intensities of the de-excitation γ-rays from each doublet can not be reproduced by the theoretical excitation functions if the deexciting γ-rays belong to a single level.
# Rounded-off value from Adopted Levels.
@ From comparisons of the measured γ-yields with the theoretical predictions based on the statistical model of the compound nucleus in 1996De48, unless otherwise noted.

γ(^{209}Bi)

Several transitions were assigned to specific levels by the authors of 1984Pr08 on the basis of previously known levels. In several cases, the adopted J^π values now suggest that such placements are unlikely. In other cases, more precise level energies now available argue against the placement. The evaluators have reassigned these transitions as being unplaced. The individual cases are noted.

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^{209}Bi(n,n′γ) 1984Pr08,1996De48,2008Mi01 (continued)

γ(^{209}Bi) (continued)

E_γ[†]	I_γ[a]	E_i(level)	J_i^π	E_f	J_f^π	% branching[b]	Comments
79.0[&]		2845.9	(1/2$^+$)	2766.89	(3/2$^+$)	15	Additional information 22.
110.5[&] 5		2955.85	(3/2$^+$)	2845.9	(1/2$^+$)	3	Additional information 25.
123.7[&] 5		2617.37	(5/2$^+$)	2493.02	(3/2$^+$)	3	Additional information 10.
131.7[&]		3221.7	(7/2$^+$)	3089.95	(9/2$^+$)	9	Additional information 43.
141.3		2741.20	(15/2$^+$)	2599.92	(11/2$^+$)	7	Additional information 13.
149.5[&]		2766.89	(3/2$^+$)	2617.37	(5/2$^+$)	5	Additional information 16.
150.7[&] 5		2917.6	(5/2$^+$)	2766.89	(3/2$^+$)		Additional information 24.
167.7[&]		3154.6	(17/2$^+$,19/2$^+$)	2986.9	(21/2$^-$)	6	Additional information 40.
225.1[&]		3211.9		2986.9	(21/2$^-$)		
243.7[&]		3159.3		2917.6	(5/2$^+$)	35	
245.7[&] 5		2986.9	(21/2$^-$)	2741.20	(15/2$^+$)		Additional information 29.
265.7[&] 5		3221.7	(7/2$^+$)	2955.85	(3/2$^+$)	31	Additional information 44.
270.4[&]		3406.28	(11/2$^+$)	3135.88	(15/2$^+$)	19	Additional information 55.
272.2[&]		3039.07	(5/2$^+$)	2766.89	(3/2$^+$)	35	Additional information 30.
273.9[&]		2766.89	(3/2$^+$)	2493.02	(3/2$^+$)	35	Additional information 17.
290.4[&]		3502.2		3211.9			
313.7[&]		3468.0		3154.6	(17/2$^+$,19/2$^+$)	20	
314.2[&]		3159.3		2845.9	(1/2$^+$)	41	
324.0[&]		2766.89	(3/2$^+$)	2442.84	(1/2$^+$)	55	Additional information 18.
338.8[&] 5		2955.85	(3/2$^+$)	2617.37	(5/2$^+$)	10	Additional information 26.
352.3[&]		3197.4		2845.9	(1/2$^+$)		
392.6[&]		3159.3		2766.89	(3/2$^+$)	24	
394.7[&]		3135.88	(15/2$^+$)	2741.20	(15/2$^+$)	9	Additional information 37. I_γ: I(394.7γ)/I(1527.3γ)=0.175 *23* (2008Mi01).
403.7[&] 5		2845.9	(1/2$^+$)	2442.84	(1/2$^+$)	85	Additional information 23.
413.4 5	4 *1*	3154.6	(17/2$^+$,19/2$^+$)	2741.20	(15/2$^+$)	94	Additional information 41.
423.7[&]		3269.6		2845.9	(1/2$^+$)		Additional information 46.
424.9[&]		3579.0		3154.6	(17/2$^+$,19/2$^+$)	56	
443.2[&]		3597.1		3154.6	(17/2$^+$,19/2$^+$)	16	
455.0[&] 5		3221.7	(7/2$^+$)	2766.89	(3/2$^+$)	60	Additional information 45.

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^{209}Bi(n,n′γ) 1984Pr08,1996De48,2008Mi01 (continued)

γ(^{209}Bi) (continued)

E_γ[†]	I_γ[a]	E_i(level)	J_i^π	E_f	J_f^π	% branching[b]	Comments
463.5[&] *5*		2955.85	(3/2$^+$)	2493.02	(3/2$^+$)	71	Additional information 27.
480.9[&]		3468.0		2986.9	(21/2$^-$)	80	Additional information 60.
513.0[&]		2955.85	(3/2$^+$)	2442.84	(1/2$^+$)	2	Additional information 28.
588.1[&]		3354.8		2766.89	(3/2$^+$)		
592.2[&]		3579.0		2986.9	(21/2$^-$)	44	
610.3[&]		3597.1		2986.9	(21/2$^-$)	84	
664.1[&] *5*		3703.2	(7/2$^+$,9/2)	3039.07	(5/2$^+$)		Additional information 72.
806.4 *7*	0.8 *2*	3406.28	(11/2$^+$)	2599.92	(11/2$^+$)	26	Additional information 56.
808.0 *10*	0.5 *2*	3574.88	(7/2$^+$)	2766.89	(3/2$^+$)	63	Additional information 65.
896.2 *1*	100	896.16	(7/2$^-$)	0	9/2$^-$		Additional information 1.
921.9 *8*	0.8 *2*	3505.13	5/2$^-$,7/2$^-$	2583.04	(9/2)$^+$	72	
[x]949 *2*	0.4 *3*						
992.6 *1*	15.9 *3*	2601.17	(13/2$^+$,15/2$^+$)	1608.57	(13/2$^+$)		Additional information 9.
1132.7 *1*	8.9 *2*	2741.20	(15/2$^+$)	1608.57	(13/2$^+$)	47	Additional information 14. I$_\gamma$: I(1132.7γ)/I(2741.1γ)=0.771 *35* (2008Mi01).
1253 *1*	0.3 *1*	3817.85	(11/2$^+$,13/2$^+$)	2564.12	(9/2)$^+$	48	Additional information 78.
1524.6[&] *5*		3133.03	(13/2$^+$)	1608.57	(13/2$^+$)	29	Additional information 35.
1527.3 *1*	5.2 *1*	3135.88	(15/2$^+$)	1608.57	(13/2$^+$)	91	Additional information 38.
1546.7[@] *1*	7.07 *14*	2442.84	(1/2$^+$)	896.16	(7/2$^-$)		Additional information 3.
1560.7 *1*	3.62 *9*	3169.28	(11/2$^+$)	1608.57	(13/2$^+$)		Additional information 42.
1608.6 *1*	88.3 *18*	1608.57	(13/2$^+$)	0	9/2$^-$		Additional information 2.
1686.8 *1*	4.5 *1*	2583.04	(9/2)$^+$	896.16	(7/2$^-$)	69	Additional information 6.
1721.2 *1*	2.1 *1*	2617.37	(5/2$^+$)	896.16	(7/2$^-$)	63	Additional information 11.
1785.9 *1*	1.39 *8*	3394.48	(17/2$^+$)	1608.57	(13/2$^+$)		Additional information 52.
1797.7 *1*	1.01 *7*	3406.28	(11/2$^+$)	1608.57	(13/2$^+$)	54	Additional information 57.
1930.2 *2*	0.65 *5*	2826.14	(5/2$^-$)	896.16	(7/2$^-$)	30	Additional information 20. I$_\gamma$: I(1930.2γ)/I(2825.9γ)=0.371 *19* (2008Mi01).
2142.9 *1*	1.26 *4*	3039.07	(5/2$^+$)	896.16	(7/2$^-$)	65	Additional information 31.
2193.9 *2*	0.33 *3*	3089.95	(9/2$^+$)	896.16	(7/2$^-$)	23	Additional information 32.
[x]2199.9 *2*	0.45 *3*						

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^{209}Bi(n,n′γ) 1984Pr08,1996De48,2008Mi01 (continued)

γ(^{209}Bi) (continued)

E_γ [†]	I_γ [a]	E_i(level)	J_i^π	E_f	J_f^π	% branching [b]	Comments
2209.3 *2*	0.32 *3*	3817.85	(11/2$^+$,13/2$^+$)	1608.57	(13/2$^+$)	52	Additional information 79.
2223.2[&] *5*		3119.4	(3/2$^-$)	896.16	(7/2$^-$)		Additional information 34.
[x]2282.6 *2*	0.28 *3*						
[x]2356.9 *8*	0.1 *2*						
2391.8 *2*	0.21 *2*	4000.71	(11/2$^-$)	1608.57	(13/2$^+$)	64	Additional information 90.
[x]2398.5 *2*	0.22 *2*						
2414.7 *1*	0.63 *2*	3310.75	(9/2$^+$)	896.16	(7/2$^-$)	71	Additional information 47.
2465.7 *1*	0.5 *2*	3361.88	(3/2$^+$)	896.16	(7/2$^-$)		Additional information 49.
2482.0 *2*	0.31 *2*	3378.14	(9/2$^+$)	896.16	(7/2$^-$)	25	Additional information 50.
2488.2 *3*	0.17 *2*	4096.34		1608.57	(13/2$^+$)		
2493.0 *1*	5.46 *11*	2493.02	(3/2$^+$)	0	9/2$^-$		Additional information 4.
2498.7 *1*	0.79 *2*	3394.90	(7/2$^+$,9/2$^+$)	896.16	(7/2$^-$)	80	Additional information 53.
2539.6 *2*	0.20 *2*	4148.10		1608.57	(13/2$^+$)		
2554.0 *2*	0.21 *2*	3450.18	(3/2$^-$)	896.16	(7/2$^-$)		Additional information 58.
2564.1 *1*	5.45 *11*	2564.12	(9/2)$^+$	0	9/2$^-$		Additional information 5.
2583.1 *1*	1.35 *3*	2583.04	(9/2)$^+$	0	9/2$^-$	31	Additional information 7. I_γ: I(2583.1γ)/I(1686.8γ)=0.468 *18* (2008Mi01).
2593.6 *2*	0.58 *2*	3489.58	(9/2$^-$)	896.16	(7/2$^-$)	78	Additional information 61.
2599.9 *1*	6.80 *14*	2599.92	(11/2$^+$)	0	9/2$^-$		Additional information 8.
2609.0 *2*	0.31 *2*	3505.13	5/2$^-$,7/2$^-$	896.16	(7/2$^-$)	28	
2617.4 *1*	1.05 *2*	2617.37	(5/2$^+$)	0	9/2$^-$	34	Additional information 12.
2645.3 *2*	0.40 *2*	3541.73	(5/2$^-$)	896.16	(7/2$^-$)	84	Additional information 63.
[x]2671.4 *12*	0.02 *2*						
2678.7 *2*	0.29 *2*	3574.88	(7/2$^+$)	896.16	(7/2$^-$)	37	Additional information 66. I_γ: I(2678.7γ)/I(808.0γ)=1.13 *7* (2008Mi01).
2705.4 *1*	0.60 *2*	3601.58	(9/2$^+$,11/2$^+$)	896.16	(7/2$^-$)	94	Additional information 67.
2726.7 *3*	0.11 *2*	4335.3		1608.57	(13/2$^+$)		
2741.1 *1*	10.62 *21*	2741.20	(15/2$^+$)	0	9/2$^-$	46	Additional information 15.
2753.3 *2*	0.15 *2*	4361.89		1608.57	(13/2$^+$)		
[x]2762.6 *4*	0.09 *2*						
2766.9 *2*	0.18 *2*	2766.89	(3/2$^+$)	0	9/2$^-$	5	Additional information 19.
2806.2 *6*	0.05 *2*	3702.34?	(11/2$^+$)	896.16	(7/2$^-$)	8	Additional information 70.
2825.9 *2*	1.35 *3*	2826.14	(5/2$^-$)	0	9/2$^-$	70	Additional information 21.

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^{209}Bi(n,n′γ) 1984Pr08,1996De48,2008Mi01 (continued)

γ(^{209}Bi) (continued)

E_γ[†]	I_γ[a]	E_i(level)	J_i^π	E_f	J_f^π	% branching[b]	Comments
2855.9 *3*	0.12 *1*	3752.1		896.16	(7/2$^-$)		
2862.5 *3*	0.18 *1*	4471.0		1608.57	(13/2$^+$)		
2876.2 *1*	0.29 *1*	4484.79		1608.57	(13/2$^+$)		
2886.8 *1*	0.43 *1*	3782.98	(7/2$^+$,9/2$^+$)	896.16	(7/2$^-$)		E_γ: placed by 1996De48 and 2008Mi01, unplaced in 1984Pr08. Additional information 75.
2904.5 *2*	0.20 *1*	3800.71	(11/2$^+$)	896.16	(7/2$^-$)	59	Additional information 76.
2906.6 *1*	0.31 *1*	4515.22		1608.57	(13/2$^+$)		
x2920.5[‡] *1*	0.28 *1*						
x2941.2[#] *2*	0.18 *1*						
2954.7 *4*	0.17 *1*	2955.85	(3/2$^+$)	0	9/2$^-$	14	
3009.6 *3*	0.15 *1*	3905.8	(9/2$^+$,11/2$^+$)	896.16	(7/2$^-$)	84	Additional information 82.
3024.5 *5*	0.056 *11*	3921.22	(9/2$^+$,11/2$^+$)	896.16	(7/2$^-$)	20	Additional information 84.
3066.1 *3*	0.15 *1*	3962.21	(9/2$^-$)	896.16	(7/2$^-$)	55	Additional information 87.
3089.9 *1*	1.71 *4*	3089.95	(9/2$^+$)	0	9/2$^-$	77	Additional information 33.
x3118.8[‡] *8*	0.035 *10*						
3133.0 *1*	2.37 *5*	3133.03	(13/2$^+$)	0	9/2$^-$	71	Additional information 36.
3152.7 *1*	2.08 *4*	3152.73	(9/2$^+$)	0	9/2$^-$		Additional information 39.
3181.1 *5*	0.050 *10*	4789.8		1608.57	(13/2$^+$)		
x3225.5[‡] *6*	0.14 *1*						
3251.6 *6*	0.041 *9*	4148.10		896.16	(7/2$^-$)		
3262.8 *5*	0.052 *9*	4158.78		896.16	(7/2$^-$)		
x3282.6 *3*	0.078 *9*						
3310.6 *1*	0.30 *1*	3310.75	(9/2$^+$)	0	9/2$^-$	29	Additional information 48.
x3328.6 *4*	0.059 *8*						
x3331.8 *2*	0.11 *1*						
x3341.7 *5*	0.053 *8*						
3378.1 *1*	0.71 *2*	3378.14	(9/2$^+$)	0	9/2$^-$	75	Additional information 51.
3395.6[&] *5*		3394.90	(7/2$^+$,9/2$^+$)	0	9/2$^-$	20	Additional information 54. E_γ: 1984Pr08 doesn′t report a γ-ray of this energy, but in the Fig. 1 this paper, there is an apparent peak at this energy.
3401.6 *3*	0.086 *8*	4297.69		896.16	(7/2$^-$)		
x3455.9 *7*	0.030 *8*						
x3460.0 *4*	0.061 *8*						
3464.1 *1*	0.94 *2*	3464.13	(9/2$^+$)	0	9/2$^-$		Additional information 59.
3485.0 *2*	0.12 *1*	4381.19		896.16	(7/2$^-$)		
3489.1 *3*	0.21 *1*	3489.58	(9/2$^-$)	0	9/2$^-$	22	Additional information 62.
3491.9 *2*	0.13 *1*	4388.04		896.16	(7/2$^-$)		
x3499.3 *6*	0.038 *7*						

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^{209}Bi(n,n′γ) 1984Pr08,1996De48,2008Mi01 (continued)

γ(^{209}Bi) (continued)

E_γ †	I_γ [a]	E_i(level)	J_i^π	E_f	J_f^π	% branching [b]	Comments
3542.7 *4*	0.077 *7*	3541.73	(5/2$^-$)	0	9/2$^-$	16	Additional information 64.
3558.5 *3*	0.090 *7*	5167.3		1608.57	(13/2$^+$)		
x3577.5 *4*	0.054 *7*						
x3581.2 *2*	0.10 *1*						
3601.7 *6*	0.037 *7*	3601.58	(9/2$^+$,11/2$^+$)	0	9/2$^-$	6	Additional information 68.
x3607.2‡ *5*	0.047 *7*						
x3632.9‡ *15*	0.020 *9*						
3692.1 *1*	0.60 *1*	3692.14	(11/2$^-$)	0	9/2$^-$		Additional information 69.
3702.3 *1*	0.55 *1*	3702.34?	(11/2$^+$)	0	9/2$^-$	92	Additional information 71.
3717.6 *1*	0.27 *1*	3717.64	(5/2$^+$)	0	9/2$^-$		Additional information 73.
3766.9 *3*	0.067 *6*	3766.9	(5/2$^+$)	0	9/2$^-$		Additional information 74.
x3774.8 *6*	0.031 *6*						
3785.4 *16*	0.025 *8*	4681.9		896.16	(7/2$^-$)		
3800.7 *2*	0.14 *1*	3800.71	(11/2$^+$)	0	9/2$^-$	41	Additional information 77.
3815.9 *4*	0.051 *6*	5424.62		1608.57	(13/2$^+$)		
3849.9 *2*	0.19 *1*	3849.94	(7/2$^-$)	0	9/2$^-$		Additional information 80.
3854.4 *2*	0.15 *1*	4750.71		896.16	(7/2$^-$)		
3866.0 *3*	0.058 *6*	4762.2		896.16	(7/2$^-$)		
3884.3 *5*	0.041 *6*	3884.3		0	9/2$^-$		
3889.5 *3*	0.070 *6*	3889.5	(5/2$^+$)	0	9/2$^-$		Additional information 81.
3902.0 *4*	0.046 *6*	5510.53		1608.57	(13/2$^+$)		
3905.9 *7*	0.028 *6*	3905.8	(9/2$^+$,11/2$^+$)	0	9/2$^-$	16	Additional information 83.
3921.2 *1*	0.22 *1*	3921.22	(9/2$^+$,11/2$^+$)	0	9/2$^-$	80	Additional information 85.
3936.7 *1*	0.19 *1*	3936.74	(7/2$^-$)	0	9/2$^-$		Additional information 86.
3941.4 *6*	0.033 *5*	4837.6		896.16	(7/2$^-$)		
3962.1 *3*	0.18 *1*	3962.21	(9/2$^-$)	0	9/2$^-$	45	Additional information 88.
x3977.3 *1*	0.23 *1*						
3980.0 *1*	0.45 *1*	3980.04	(9/2$^-$,11/2$^-$)	0	9/2$^-$		Additional information 89.
3983.1 *2*	0.12 *1*	4879.37		896.16	(7/2$^-$)		
x3993.2 *5*	0.038 *5*						
4001.0 *2*	0.12 *1*	4000.71	(11/2$^-$)	0	9/2$^-$	36	Additional information 91.
x4004.6 *2*	0.11 *1*						
4009.3 *4*	0.053 *5*	4009.3		0	9/2$^-$		
x4033.0 *5*	0.038 *5*						
4036.5 *4*	0.041 *5*	4036.5		0	9/2$^-$		
4046.5 *2*	0.081 *5*	4046.54		0	9/2$^-$		
4051.8 *5*	0.063 *5*	4948.2		896.16	(7/2$^-$)		
x4061.8 *2*	0.15 *1*						
4088.3 *1*	0.22 *1*	4088.34		0	9/2$^-$		
4096.1 *2*	0.32 *1*	4096.34		0	9/2$^-$		
x4107.3 *4*	0.045 *5*						

Continued on next page (footnotes at end of table)

^{209}Bi(n,n′γ) 1984Pr08,1996De48,2008Mi01 (continued)

γ(^{209}Bi) (continued)

E_γ[†]	I_γ[a]	E_i(level)	J_i^π	E_f	J_f^π
4134 *2*	0.011 *5*	4134.0		0	9/2⁻
4148.0 *2*	0.15 *1*	4148.10		0	9/2⁻
4158.7 *2*	0.24 *1*	4158.78		0	9/2⁻
4160.9 *7*	0.03 *1*	4160.9		0	9/2⁻
4176.1 *1*	0.25 *1*	4176.14		0	9/2⁻
[x]4180.4 *2*	0.12 *1*				
[x]4195.9 *4*	0.044 *5*				
4207.5 *4*	0.23 *1*	4207.5		0	9/2⁻
4222.9 *7*	0.025 *5*	4222.9		0	9/2⁻
4233.7 *2*	0.11 *1*	4233.75		0	9/2⁻
[x]4237.7 *2*	0.10 *1*				
[x]4248.2 *2*	0.086 *5*				
4262.9 *2*	0.095 *5*	4262.95		0	9/2⁻
[x]4281.4[‡] *3*	0.10 *1*				
4297.6 *2*	0.069 *4*	4297.69		0	9/2⁻
4300.7 *1*	0.15 *1*	4300.75		0	9/2⁻
[x]4304.6 *2*	0.087 *4*				
4340.7 *5*	0.026 *4*	4340.7		0	9/2⁻
[x]4354.4[#] *5*	0.029 *4*				
4376.5 *6*	0.024 *4*	4376.5		0	9/2⁻
4387.7 *5*	0.029 *4*	4388.04		0	9/2⁻
4397.8 *2*	0.071 *4*	4397.85		0	9/2⁻
4409.1 *2*	0.077 *4*	4409.05		0	9/2⁻
[x]4414.1 *4*	0.035 *4*				
4441.6 *10*	0.015 *4*	4441.7		0	9/2⁻
[x]4454.6 *9*	0.017 *4*				
4470.5 *6*	0.035 *4*	4471.0		0	9/2⁻
4506.8 *2*	0.083 *4*	4506.85		0	9/2⁻
[x]4511.0 *9*	0.016 *4*				
4515.3 *2*	0.062 *4*	4515.22		0	9/2⁻
[x]4550.2 *3*	0.042 *4*				
[x]4570.4 *3*	0.042 *4*				
[x]4578.6 *8*	0.070 *5*				
4587.8 *6*	0.024 *3*	4587.9		0	9/2⁻
[x]4590.8 *7*	0.020 *3*				
4602.5 *13*	0.010 *3*	4602.6		0	9/2⁻
[x]4606.0 *2*	0.060 *4*				
4627.0 *5*	0.025 *3*	5523.4		896.16	(7/2⁻)
4641.8 *8*	0.017 *3*	5538.3		896.16	(7/2⁻)
4646.0 *3*	0.041 *3*	4646.1		0	9/2⁻
[x]4650.4 *3*	0.057 *3*				
4663.0 *7*	0.040 *3*	5559.5		896.16	(7/2⁻)
4682.0 *9*	0.015 *3*	4681.9		0	9/2⁻
[x]4685.9 *5*	0.025 *3*				
[x]4691.4[‡] *3*	0.040 *3*				
[x]4702.2[‡] *4*	0.032 *3*				
4713.5 *3*	0.054 *3*	5609.7		896.16	(7/2⁻)
4750.9 *3*	0.050 *3*	4750.71		0	9/2⁻
4755.7 *2*	0.067 *3*	4755.76		0	9/2⁻
4762.2 *5*	0.026 *3*	4762.2		0	9/2⁻
[x]4766.7 *3*	0.051 *3*				
[x]4780.3 *5*	0.025 *3*				
4790.0 *6*	0.050 *4*	4789.8		0	9/2⁻
4796.0 *3*	0.042 *3*	4796.1		0	9/2⁻
[x]4801.7 *3*	0.041 *3*				
[x]4823.4 *8*	0.015 *3*				
4830.2 *3*	0.053 *3*	4830.3		0	9/2⁻
4837.5 *3*	0.047 *3*	4837.6		0	9/2⁻
[x]4848.5[‡] *6*	0.022 *3*				
4853.4 *2*	0.066 *3*	4853.46		0	9/2⁻
4879.6 *4*	0.032 *3*	4879.37		0	9/2⁻
[x]4912.9[‡] *6*	0.020 *3*				
[x]4923.7 *4*	0.034 *3*				
[x]4928.5 *3*	0.042 *3*				
4948.6 *8*	0.025 *3*	4948.2		0	9/2⁻
4967.5 *15*	0.016 *4*	4967.6		0	9/2⁻
[x]4985.2 *7*	0.016 *3*				
4996.1 *3*	0.040 *3*	4996.2		0	9/2⁻
[x]5002.3 *2*	0.058 *3*				
[x]5012.4 *4*	0.032 *3*				
[x]5031.0 *3*	0.044 *3*				
[x]5035.3 *9*	0.012 *3*				
5056.6 *6*	0.020 *3*	5056.7		0	9/2⁻
[x]5074.9 *5*	0.023 *3*				
[x]5096.6 *8*	0.014 *2*				
[x]5145.2 *5*	0.024 *2*				
[x]5154.8 *5*	0.019 *2*				
[x]5163.9 *3*	0.044 *2*				
5167.6 *5*	0.023 *2*	5167.3		0	9/2⁻
5182.6 *7*	0.017 *2*	5182.7		0	9/2⁻
[x]5197.4 *6*	0.019 *2*				
[x]5204.5 *7*	0.016 *2*				
[x]5209.6 *4*	0.029 *2*				
[x]5217.6[‡] *3*	0.043 *2*				
5235.0 *3*	0.037 *2*	5235.1		0	9/2⁻
[x]5245.9 *5*	0.021 *2*				
[x]5278.6 *4*	0.032 *2*				
5281.8 *11*	0.010 *2*	5281.9		0	9/2⁻
5293.3 *6*	0.020 *2*	5293.4		0	9/2⁻
5312.5 *13*	0.018 *3*	5312.6		0	9/2⁻
[x]5331.3 *9*	0.012 *2*				
5353.9 *4*	0.030 *2*	5354.0		0	9/2⁻
[x]5358.4 *11*	0.010 *2*				
[x]5361.5[‡] *12*	0.008 *2*				
[x]5371.8[‡] *7*	0.014 *2*				
[x]5384.0 *4*	0.024 *2*				
5404.4 *6*	0.017 *2*	5404.5		0	9/2⁻
5411.1 *6*	0.018 *2*	5411.2		0	9/2⁻
5424.6 *3*	0.041 *2*	5424.62		0	9/2⁻
5440.1 *10*	0.010 *2*	5440.2		0	9/2⁻
5464.5 *8*	0.013 *2*	5464.6		0	9/2⁻
5484.3 *5*	0.020 *2*	5484.4		0	9/2⁻
5497.9 *10*	0.010 *2*	5498.0		0	9/2⁻
5510.4 *3*	0.032 *2*	5510.53		0	9/2⁻
5523.9 *9*	0.011 *2*	5523.4		0	9/2⁻
5538.7 *10*	0.010 *2*	5538.3		0	9/2⁻
5559.8 *8*	0.025 *3*	5559.5		0	9/2⁻
5570.5 *7*	0.013 *2*	5570.6		0	9/2⁻
[x]5580.9 *5*	0.020 *2*				
5589.1 *7*	0.015 *2*	5589.2		0	9/2⁻

Continued on next page (footnotes at end of table)

^{209}Bi(n,n′γ) 1984Pr08,1996De48,2008Mi01 (continued)

γ(^{209}Bi) (continued)

E_γ †	I_γ [a]	E_i(level)	E_f	J_f^π	E_γ †	I_γ [a]	E_i(level)	E_f	J_f^π
[x]5602.5 *7*	0.015 *2*				[x]5846.1 *5*	0.017 *2*			
[x]5621.2 *7*	0.014 *2*				5925.0 *17*	0.010 *3*	5925.1	0	9/2⁻
5652.5 *8*	0.012 *2*	5652.6	0	9/2⁻	6944.7 *21*	0.003 *1*	6944.8	0	9/2⁻
[x]5792.4 *7*	0.012 *2*				7176.5 *10*	0.008 *1*	7176.6	0	9/2⁻
[x]5820.2 *7*	0.012 *2*				7243.8 *13*	0.005 *1*	7243.9	0	9/2⁻

† Values with uncertainties are deduced by evaluators from the recoil-corrected energies quoted in 1984Pr08 and those without uncertainties are from level-energy differences, unless otherwise noted.

‡ Placed by 1984Pr08 as a ground-state transition.

Placed by 1984Pr08 as feeding the first-excited state.

@ The 1547γ was assigned by 1984Pr08 to a level at 3154; however, the branching relative to the 413γ is not consistent with data from (t,2nγ). Also, Iγ(1546.7) from (t,2nγ) at 13 and 16 MeV are not consistent with placement from the 3154 level. The 1546.7γ is assigned in (t,2nγ) as feeding the first-excited state, and coincidence data in that reaction exhibit no evidence for a 3154 to 1608 cascade. 1996De48 place the transition from the 2442.8 level defining a level at 2442.8.

& From 1996De48. No uncertainties are given in 1996De48. The evaluators have assigned ΔE=0.5 keV to those γ energies measured by 1996De48. Values quoted without uncertainties are from level-energy differences.

[a] From 1984Pr08, unless otherwise noted. Some of the uncertainties as given in 1984Pr08 are too small. They should not be smaller than 2% (private communication from the first author). The evaluator has increased the uncertainty to 2% where the published uncertainty is smaller than this value.

[b] % branching from each level (1996De48).

[x] γ ray not placed in level scheme.

^{209}Bi(n,n′γ) 1984Pr08,1996De48,2008Mi01

Level Scheme

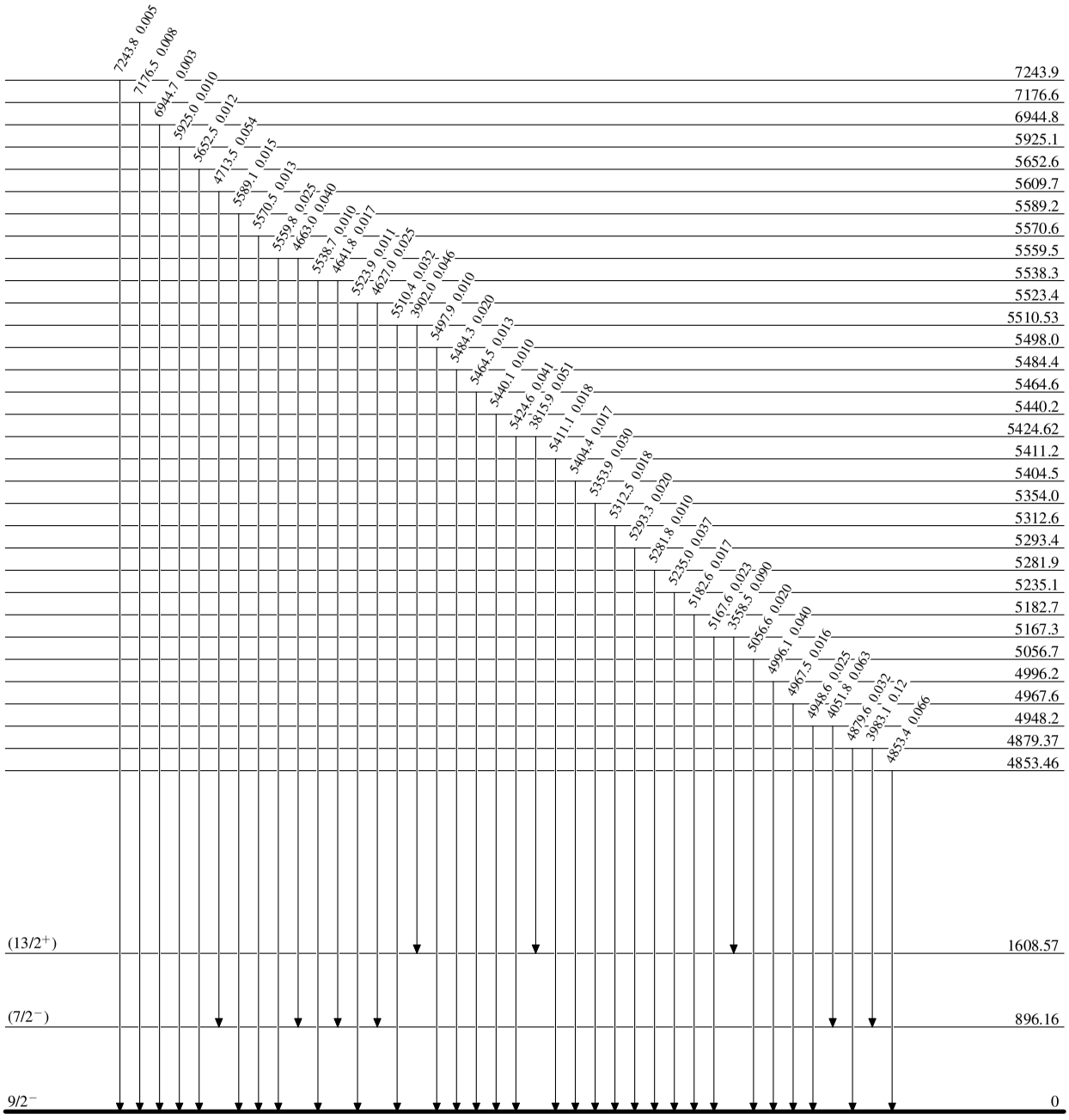
Intensities: Relative I_γ

Legend

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

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

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



$^{209}_{83}Bi_{126}$

^{209}Bi(n,n′γ) 1984Pr08,1996De48,2008Mi01

Level Scheme (continued)

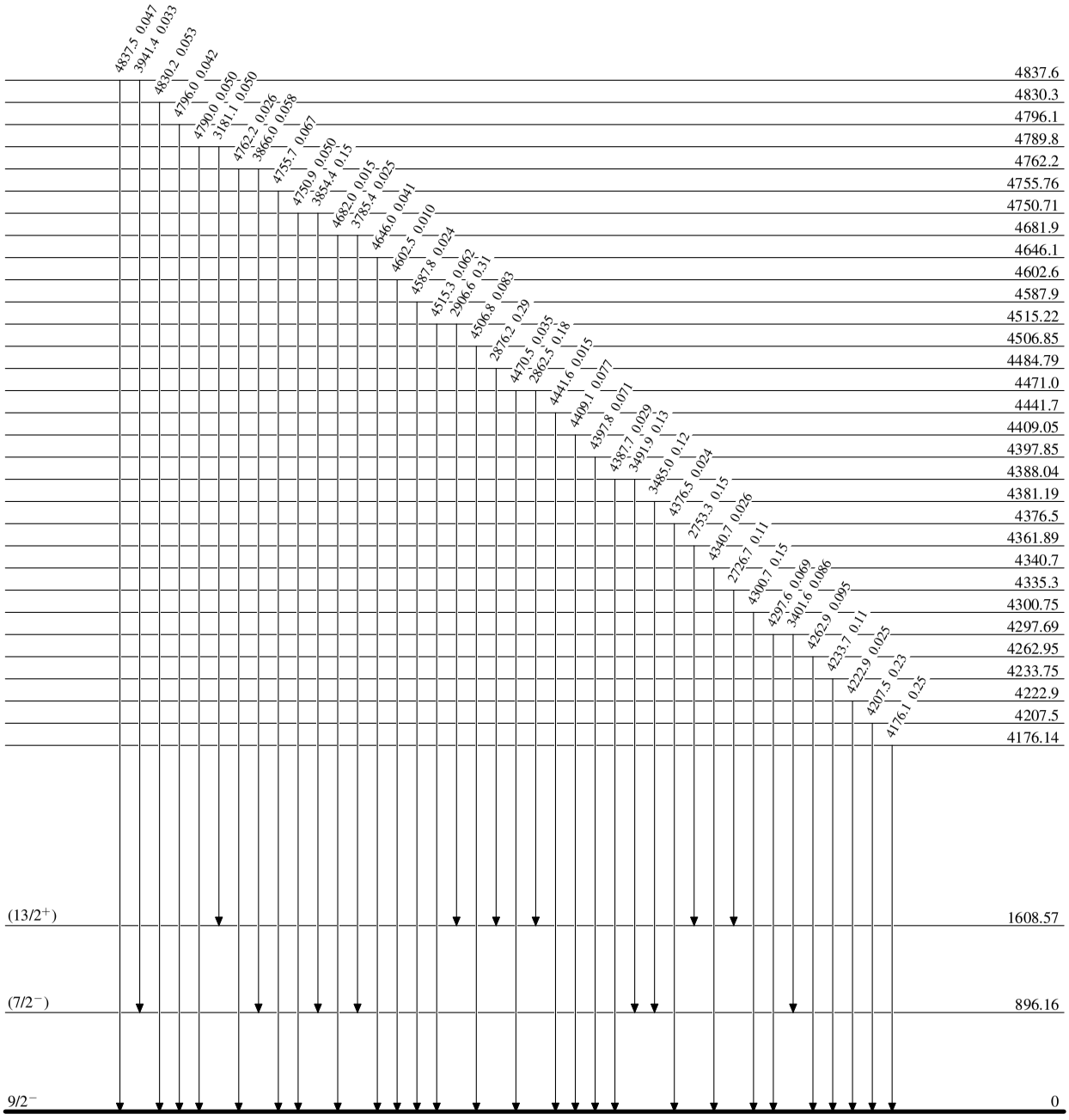
Intensities: Relative I_γ

Legend

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

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

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



$^{209}_{83}Bi_{126}$

^{209}Bi(n,n′γ) 1984Pr08,1996De48,2008Mi01

Level Scheme (continued)

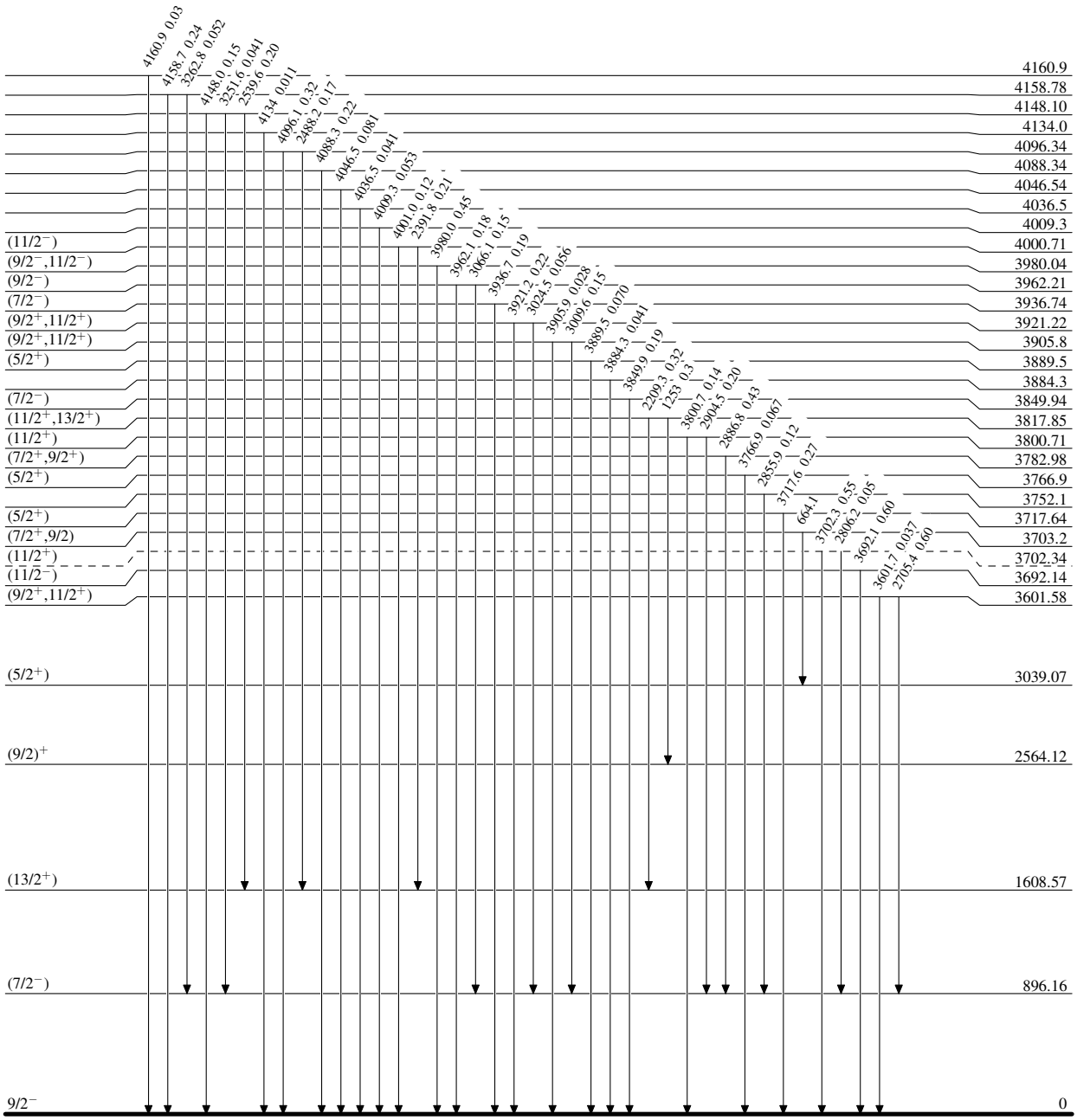
Intensities: Relative I_γ

Legend

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

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

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



$^{209}_{83}Bi_{126}$

^{209}Bi(n,n′γ) 1984Pr08,1996De48,2008Mi01

Level Scheme (continued)

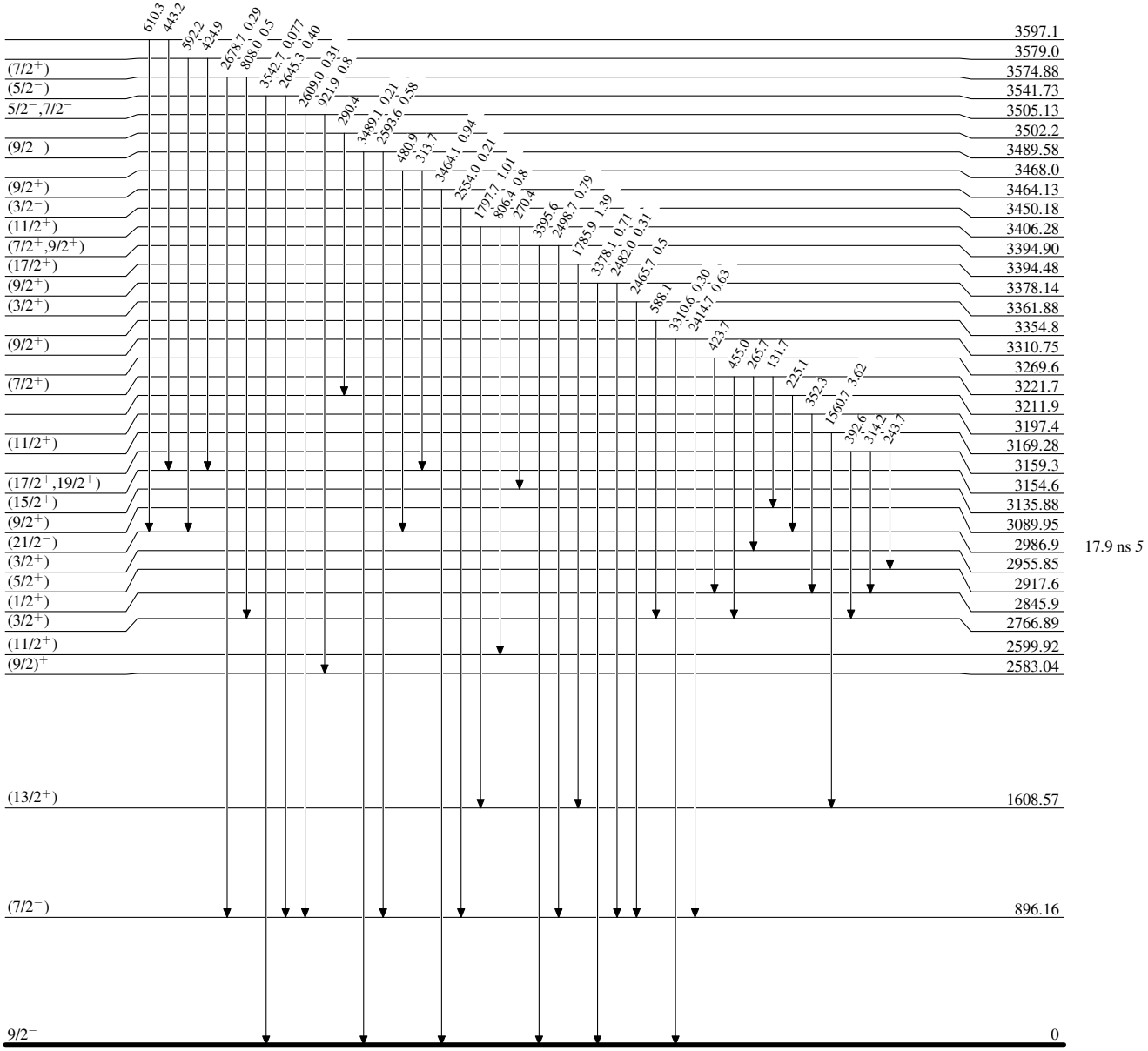
Intensities: Relative I_γ

Legend

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

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

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



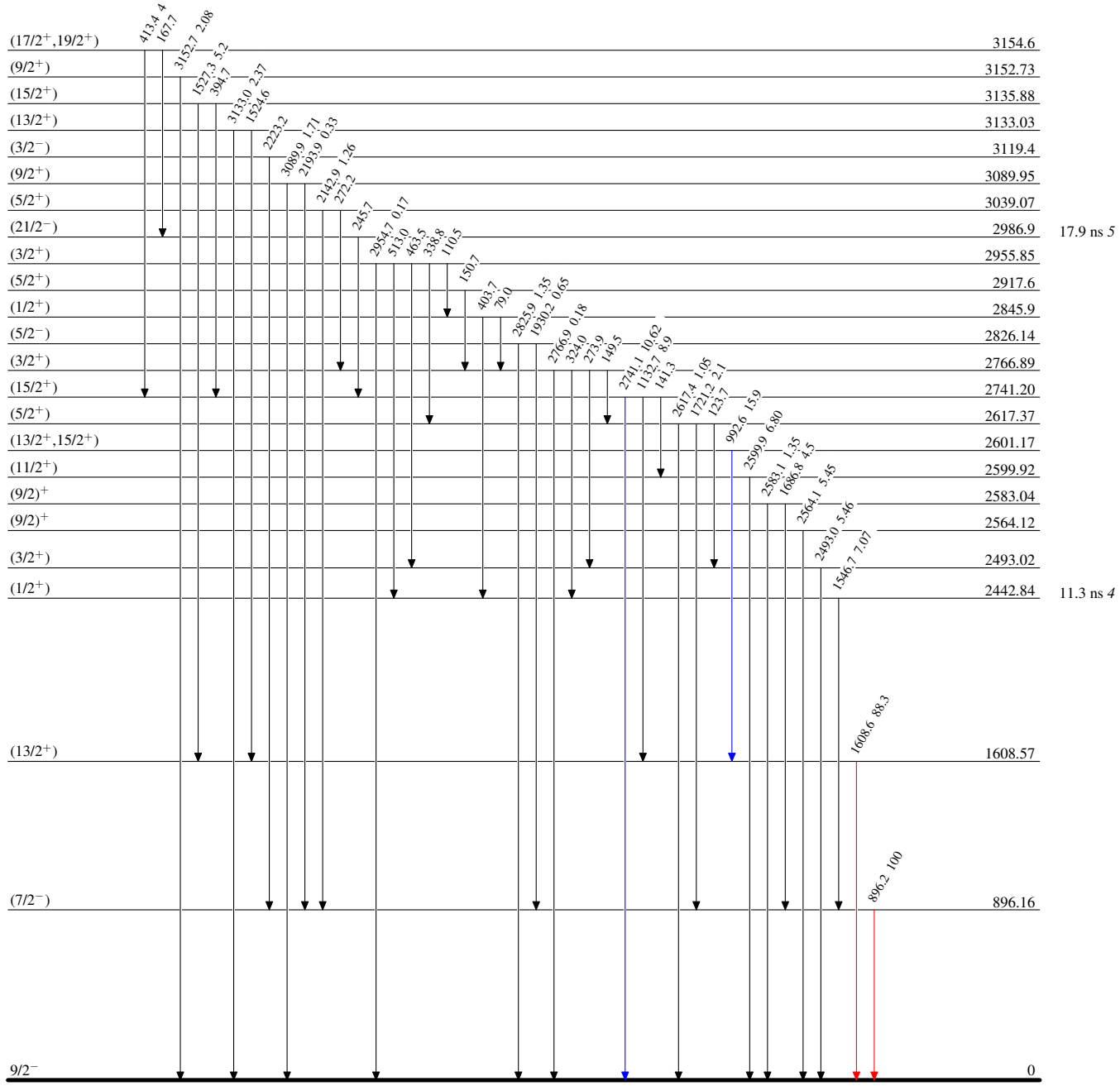
$^{209}_{83}Bi_{126}$

^{209}Bi(n,n′γ) 1984Pr08,1996De48,2008Mi01

Level Scheme (continued)

Intensities: Relative I_γ

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



$^{209}_{83}Bi_{126}$