^{208}Pb(p,p′γ),^{207}Pb(d,pγ)

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	M. J. Martin	NDS 108,1583 (2007)	1-Jun-2007

1968Cr05 E(p)=16-18 MeV.
1976Fr21 E(p)=24 MeV, E(d)=24 MeV.
1981Di08 E(p)=16.2-17.8 MeV.
1987Ju06 E(p)=17.3 MeV. Data are also quoted In 1990Tr01.
1996Ra07 E(p)=16.5, 17, 17.45, 17.5, 18.5 MeV. E(d)=10 MeV.
1997Ra17 revision of Eγ data from 1996Ra07 based on new (d,pγ) work.
2005Or02 E(p)=17.3 MeV.
The bombarding energies of 1996Ra07 preferentially populate states of ^{208}Pb through proton decay of the $3d_{5/2}$, $4s_{1/2}$, $2g_{7/2}$, and $3d_{3/2}$ isobaric analog resonances In ^{209}Bi. E=18.5 MeV is a non-resonant bombarding energy. 1968Cr05 and 1981Di08 studied decay via the $3d_{5/2}$, $4s_{1/2}$, and $3d_{3/2}$ resonances. For each of the gammas seen by 1968Cr05 these authors tabulate the relative intensity At each resonance.

^{208}Pb Levels

From the relative γ intensities At different bombarding energies, corresponding to excitation via different analog states, 1996Ra07 determine the neutron particle configuration for several levels. These configurations are given In comments. The $2g_{7/2}$ and $3d_{3/2}$ IAR are not resolved.

E(level)[†]	Jπ[‡]	Comments
0.0		
2614.5 *1*	3^-	
3197.7 *1*	5^-	
3475.1 *1*	4^-	
3709.2 *1*	5^-	
3920.4 *1*	6^-	
3946.6 *1*	4^-	
3961.7 *1*	5^-	
3995.5 *1*	4^-	
4037.5 *1*	7^-	
4051.3 *1*	3^-	
4085.4 *1*	2^+	
4125.6 *1*	5^-	
4180.9 *1*	5^-	
4206.0 *1*	6^-	
4229.6 *1*	2^-	
4254.9 *1*	3^-	
4261.8 *1*	4^-	
4296.7 *1*	5^-	
4324.5 *1*	4^+	
4358.7 *1*	4^-	
4382.6 *1*	6^-	
4423.6 *1*	6^+	
4481.0 *1*	6^-	
4610.6 *1*	8^+	
4698.1 *1*	3^-	
4841.5 *1*	1^-	
4870 *3*	0^+	
4936.2 *1*	3^-	configuration=$\nu 3d_{3/2}$ or $\nu 2g_{7/2}$. The $\nu 2g_{7/2}$ component is confirmed by 2006He21 In (p,p′).
4974.2 *1*	3^-	
5037.7 *1*	3^-	configuration=$\nu 3d_{5/2}$.

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^{208}Pb(p,p′γ),^{207}Pb(d,pγ) (continued)

^{208}Pb Levels (continued)

E(level)[†]	Jπ[‡]	Comments
5080?	(1⁻)	E(level),Jπ: reported only by 1968Cr05.
5085.5 *1*	7⁻	
5127.4 *1*	2⁻	configuration=$\nu 3d_{5/2}$.
5241 *3*	0⁺	
5245.2 *1*	3⁻	
5280.5 *1*	0⁻	configuration=$\nu 4s_{1/2}$.
5292.1 *1*	1⁻	configuration=$\nu 4s_{1/2}$. Jπ: 1968Cr05 determine Jπ=1⁻.
5385.6 *1*	3⁻	configuration=$\nu 3d_{5/2}$.
5480.8 *1*	5⁻	
5490.3 *5*	4⁻	configuration=$\nu 3d_{5/2}$.
5511.9 *1*	1⁻	Jπ: 1968Cr05 determine Jπ=1⁻.
5548.2 *1*	2⁺	configuration=$\nu 3d_{5/2}$ + $\nu 4s_{1/2}$.
5563.6 *1*	3⁻	
5601.7 *1*	0⁻,1⁻	
5630?		E(level): reported only by 1968Cr05.
5641.4 *5*	1,2⁺	configuration=$\nu 3d_{5/2}$ + $\nu 4s_{1/2}$.
5737.8 *3*		configuration=$\nu 3d_{5/2}$.
5777.8 *1*	2⁻,3⁻	configuration=$\nu 3d_{5/2}$.
5802.9 *8*	1,2⁺	configuration=$\nu 4s_{1/2}$.
5813.1 *2*	3⁻	configuration=$\nu 3d_{5/2}$.
5873.7 *1*	3⁻	configuration=$\nu 3d_{5/2}$ + $\nu 4s_{1/2}$ + $\nu 3d_{3/2}$ and/or $\nu 2g_{7/2}$.
5885.4 *1*	3⁻	configuration=$\nu 3d_{5/2}$ + $\nu 4s_{1/2}$.
5923.7 *1*	1⁻,2⁻	configuration=$\nu 3d_{3/2}$ and/or $\nu 2g_{7/2}$.
5946.8 *1*	1⁻	configuration=$\nu 3d_{3/2}$. configuration=$\nu 3d_{3/2}$ and/or $\nu 2g_{7/2}$ from (p,p′γ); however, $\nu 3p^{-1}_{1/2}$ for the neutron hole is determined in (d,pγ), thus, given $J^\pi=1^-$, the $2g_{7/2}$ particle component cannot contribute. Jπ: 1968Cr05 determine Jπ=1⁻.
5969.2 *1*	4⁻	configuration=$\nu 3d_{3/2}$ and/or $\nu 2g_{7/2}$.
6009.8 *1*	3⁻	configuration=$\nu 4s_{1/2}$ + $\nu 3d_{3/2}$ and/or $\nu 2g_{7/2}$.
6086.9 *1*	1⁻	configuration=$\nu 4s_{1/2}$ + $\nu 3d_{3/2}$ and/or $\nu 2g_{7/2}$.
6263.6 *1*	1⁻	
6313.8 *1*	1⁻	configuration=$\nu 4s_{1/2}$. Jπ: 1968Cr05 determine Jπ=1⁻.
6361.5 *1*	1⁻	
6394 *3*	3⁻	configuration=$\nu 3d_{3/2}$ and/or $\nu 2g_{7/2}$.
6444.3 *2*	3⁻	configuration=$\nu 3d_{3/2}$ and/or $\nu 2g_{7/2}$.
6486.4 *2*	1⁻	Jπ: 1968Cr05 determine Jπ=1⁻.
6551.8 *1*		configuration=$\nu 4s_{1/2}$ + $\nu 3d_{3/2}$ and/or $\nu 2g_{7/2}$.
6617.0 *2*	3⁻	configuration=$\nu 3d_{3/2}$ and/or $\nu 2g_{7/2}$.
6657.1 *2*	4⁺	configuration=$\nu 2g_{7/2}$. configuration=$\nu 3d_{3/2}$ and/or $\nu 2g_{7/2}$ from (p,p′γ); however, configuration=$\nu 1i^{-1}_{13/2}$ for the neutron hole is determined in (d,pγ), so, given $J^\pi=4^+$, the $3d_{3/2}$ particle component cannot contribute.
6682.3 *2*	(5⁻)	configuration=$\nu 3d_{3/2}$ and/or $\nu 2g_{7/2}$.
6692.0 *5*		
6718.4 *3*	1⁻	Jπ: 1976Fr21 determine Jπ=1⁻. configuration=$\nu 3d_{3/2}$ and/or $\nu 2g_{7/2}$.
6740.1 *1*	3⁻	configuration=$\nu 3d_{3/2}$ and/or $\nu 2g_{7/2}$.
6800.9 *20*		configuration=$\nu 3d_{3/2}$ and/or $\nu 2g_{7/2}$.
7062.1 *1*	1⁻	Jπ: 1976Fr21 determine Jπ=(1⁺); however, P′γ(θ) does not rule out the adopted value of 1⁻. the level shows essentially equal σ At the $d_{3/2}$ + $g_{9/2}$ $s_{1/2}$, and $d_{5/2}$ IAR (1981Di08).
7082.7 *5*	1⁻	Jπ: 1968Cr05 determine Jπ=1⁻. level shows strong enhancement from $d_{3/2}$ + $g_{9/2}$ IAR (1981Di08).
7241.4 *1*	1⁻	
7316 *8*		

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^{208}Pb(p,p′γ),^{207}Pb(d,pγ) (continued)

^{208}Pb Levels (continued)

† As given by 1996Ra07 based on their Eγ values.

‡ From Adopted Levels. Assignments from 1976Fr21 based on P′γ(θ) and from 1968Cr05 based on γ(θ) At the $3d_{3/2}$ IAR and observation of a large ground-state γ branch, are given In comments. 1976Fr21 show that the In-plane to out-of-plane intensity ratio for γ′s that decay to the ground state is <1 for $J^\pi=1^-$, >1 for $J^\pi=2^+$, and =1 for $J^\pi=1^+$. In the $J^\pi=1^+$ case, L=0 transfer only is assumed.

γ(^{208}Pb)

E_i(level)	J_i^π	E_γ†	I_γ†	E_f	J_f^π	Comments
2614.5	3⁻	2614.5 *1*		0.0		
3197.7	5⁻	583.2 *1*		2614.5	3⁻	
3475.1	4⁻	277.3 *1*	53 *3*	3197.7	5⁻	
		860.7 *1*	100 *5*	2614.5	3⁻	
3709.2	5⁻	233.4 *2*	24 *1*	3475.1	4⁻	
		511		3197.7	5⁻	E_γ,I_γ: cannot Be resolved from annihilation radiation. From Adopted Gammas, Eγ=510.72 *7* and Iγ/Iγ(233γ+1095γ)=31.9 *18*.
		1095.0 *1*	100 *5*	2614.5	3⁻	
3920.4	6⁻	211.7 *1*	52 *3*	3709.2	5⁻	
		722.2 *1*	100 *5*	3197.7	5⁻	
3946.6	4⁻	748.9 *1*		3197.7	5⁻	
3961.7	5⁻	253.3 *1*	37 *2*	3709.2	5⁻	
		763.2 *1*	100 *5*	3197.7	5⁻	
3995.5	4⁻	797.7 *1*	39 *2*	3197.7	5⁻	
		1381.0 *1*	100 *5*	2614.5	3⁻	
4037.5	7⁻	839.8 *1*		3197.7	5⁻	
4051.3	3⁻	576.1 *1*	29 *1*	3475.1	4⁻	
		1436.8 *1*	100 *5*	2614.5	3⁻	
4085.4	2⁺	4085.4 *1*		0.0		
4125.6	5⁻	927.9 *1*		3197.7	5⁻	
4180.9	5⁻	983.2 *1*		3197.7	5⁻	
4206.0	6⁻	1008.3 *1*		3197.7	5⁻	
4229.6	2⁻	1615.2 *1*	100 *5*	2614.5	3⁻	
		4229.5 *1*	20 *1*	0.0		
4254.9	3⁻	779.7 *1*	6 *1*	3475.1	4⁻	
		1640.4 *1*	100 *5*	2614.5	3⁻	
4261.8	4⁻	787.0 *1*	56 *3*	3475.1	4⁻	
		1647.0 *1*	100 *5*	2614.5	3⁻	
4296.7	5⁻	586.8 *1*	63# *3*	3709.2	5⁻	
		822.3 *1*	100# *5*	3475.1	4⁻	
4324.5	4⁺	363.0 *1*	29 *1*	3961.7	5⁻	
		1126.5 *1*	100 *5*	3197.7	5⁻	
4358.7	4⁻	883.6 *1*	20@ *1*	3475.1	4⁻	
		1161.1 *2*	100@ *5*	3197.7	5⁻	
4382.6	6⁻	1184.9 *1*		3197.7	5⁻	
4423.6	6⁺	1225.9 *1*		3197.7	5⁻	E_γ: multiplet.
4481.0	6⁻	1283.3 *1*		3197.7	5⁻	
4610.6	8⁺	1412.9 *1*		3197.7	5⁻	
4698.1	3⁻	436.4	24 *1*	4261.8	4⁻	E_γ: rounded-off value taken by the evaluator from (d,pγ). Value of 439.0 *1* reported by 1996Ra07 is a poor fit.
		443.7 *1*	46 *2*	4254.9	3⁻	
		468.8	14 *1*	4229.6	2⁻	E_γ: rounded-off value taken by the evaluator from (d,pγ). Value of 465.2 *1* reported by 1996Ra07 is a poor fit.
		647.2 *1*	5 *1*	4051.3	3⁻	
		1223.4‡ *3*	100‡ *30*	3475.1	4⁻	

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^{208}Pb(p,p′γ),^{207}Pb(d,pγ) (continued)

γ(^{208}Pb) (continued)

E_i(level)	J_i^π	E_γ †	I_γ †	E_f	J_f^π	Mult.	Comments
4698.1	3⁻	1500.0 *1*	33 *11*	3197.7	5⁻		
		2083.9 *1*	36 *2*	2614.5	3⁻		
		4698.1 *1*	6 *1*	0.0			
4841.5	1⁻	4841.5 *1*		0.0			I_γ: 1981Di08 report branching=93% 7.
4870	0⁺	4870 *3*		0.0		E0	E_γ,Mult.: from ce spectrum (1987Ju06). The authors′ energy value of 4866 *2* has been corrected to 4870 *3* (private communication to the evaluator from R. Julin, May, 2004) the E0 character is based on observation of strong ce lines with No corresponding photon transition. K/L=6.4 *9* (1990Tr01).
4936.2	3⁻	2322.8 *2*	100 *5*	2614.5	3⁻		
		4936.0 *1*	7 *1*	0.0			
4974.2	3⁻	719.0 *1*	5 *1*	4254.9	3⁻		
		1500.0 *1*	21 *6*	3475.1	4⁻		
		1776.5 *1*	94 *5*	3197.7	5⁻		
		2359.5 *1*	100 *5*	2614.5	3⁻		
		4972.8 *3*	1 *1*	0.0			
5037.7	3⁻	808.0 *1*	9 *1*	4229.6	2⁻		
		1562.8 *1*	12 *1*	3475.1	4⁻		
		2423.0 *1*	100 *5*	2614.5	3⁻		
5080?	(1⁻)	5080&		0.0			E_γ: reported only by 1968Cr05 with branching=67% 21.
5085.5	7⁻	879.5 *1*		4206.0	6⁻		
5127.4	2⁻	1652.3 *1*	6 *1*	3475.1	4⁻		
		2512.8 *1*	100 *5*	2614.5	3⁻		
		5127.5 *2*	14 *1*	0.0			
5241	0⁺	2626.6		2614.5	3⁻		not seen In (p,p′γ). E is from Adopted Gammas. From a study of (P,P′ce), 2005Or02 deduce an intensity limit of I(γ+ce)/Ti(5241 eo transition)<4.
		5241 *3*		0.0		E0	E_γ,Mult.: from ce spectrum (1987Ju06). The authors′ energy value of 5237 *2* has been corrected to 5241 *3* (private communication to the evaluator from R. Julin, May, 2004) the E0 character is based on observation of strong ce lines with No corresponding photon transition. 2005Or02 report E=5241.1.
5245.2	3⁻	1770.2 *2*	8 *1*	3475.1	4⁻		
		2630.7 *1*	100 *5*	2614.5	3⁻		
		5244.4 *10*	2 *1*	0.0			
5280.5	0⁻	439.0 *1*	36 *2*	4841.5	1⁻		
		1051.0 *1*	100 *5*	4229.6	2⁻		
5292.1	1⁻	5292.1 *1*		0.0			I_γ: 1981Di08 report branching=80% 8.
5385.6	3⁻	1156.3 *1*	100 *5*	4229.6	2⁻		
		2771.1 *1*	98 *30*	2614.5	3⁻		
		5384.5 *3*	24 *2*	0.0			
5480.8	5⁻	1355.2 *1*		4125.6	5⁻		
5490.3	4⁻	2292.6 *5*		3197.7	5⁻		
5511.9	1⁻	5511.9 *1*		0.0			I_γ: 1981Di08 report branching≥67%.
5548.2	2⁺	2933.7 *1*	100 *5*	2614.5	3⁻		
		5547.9 *18*	2 *1*	0.0			
5563.6	3⁻	2949.1 *1*		2614.5	3⁻		
5601.7	0⁻,1⁻	757.7 *3*	39 *2*	4841.5	1⁻		
		1372.6 *1*	100 *5*	4229.6	2⁻		
5630?		5630&		0.0			E_γ: reported only by 1968Cr05 with branching≥49%.
5641.4	1,2⁺	5641.4 *5*		0.0			
5737.8		1314.2 *3*		4423.6	6⁺		
5777.8	2⁻,3⁻	3163.3 *1*	100 *5*	2614.5	3⁻		
		5777.8 *5*	11 *1*	0.0			
5802.9	1,2⁺	5802.9 *8*		0.0			
5813.1	3⁻	2338.3 *2*	100 *5*	3475.1	4⁻		I_γ: Iγ(2338γ)/Iγ(3199γ)=0.85 *14* In (d,pγ). This suggests that

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^{208}Pb(p,p′γ),^{207}Pb(d,pγ) (continued)

γ(^{208}Pb) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Comments
						part of the 2338γ belongs elsewhere. In (n,n′γ), a 2338γ is placed from a 4953 level. IT is thus possible that this the 4953 level is being populated In (p,p′γ).
5813.1	3⁻	3198.3 *2*	56 *3*	2614.5	3⁻	
5873.7	3⁻	2398.6 *1*		3475.1	4⁻	
5885.4	3⁻	3270.9 *1*		2614.5	3⁻	
5923.7	1⁻,2⁻	678.6 *1*	26 *1*	5245.2	3⁻	
		949.6 *1*	100 *5*	4974.2	3⁻	
		1223.4[‡] *3*	30[‡] *10*			
		1668.8 *1*	25 *1*	4254.9	3⁻	
		1694.1 *1*	10 *1*	4229.6	2⁻	
		1872.5 *1*	50 *3*	4051.3	3⁻	
		5923.3 *5*	13 *1*	0.0		
5946.8	1⁻	5946.8 *1*		0.0		I_γ: 1981Di08 report branching=78% 7.
5969.2	4⁻	1763.0 *1*	21 *1*	4206.0	6⁻	
		2260.5 *1*	41 *2*	3709.2	5⁻	
		2771.1 *1*	100 *30*	3197.7	5⁻	
		5968.0 *20*	2 *1*	0.0		
6009.8	3⁻	1924.1 *3*	31 *2*	4085.4	2⁺	
		2534.7 *1*	100 *5*	3475.1	4⁻	
6086.9	1⁻	1113.1 *1*	54 *3*	4974.2	3⁻	
		1388.4 *1*	100 *5*	4698.1	3⁻	
		1832.2 *1*	88 *4*	4254.9	3⁻	
		1857.3 *1*	72 *4*	4229.6	2⁻	
		2035.7 *1*	88 *4*	4051.3	3⁻	
		3472.2 *2*	24 *1*	2614.5	3⁻	
		6087.1 *5*	5 *1*	0.0		
6263.6	1⁻	6263.6 *1*		0.0		I_γ: 1981Di08 report branching≥59%.
6313.8	1⁻	6313.8 *1*		0.0		I_γ: 1981Di08 report branching=85% 8.
6361.5	1⁻	6361.5 *1*		0.0		
6394	3⁻	2433 *3*		3961.7	5⁻	
6444.3	3⁻	2449.2 *2*	100 *5*	3995.5	4⁻	
		6443.7 *3*	90 *5*	0.0		
6486.4	1⁻	6486.4 *2*		0.0		I_γ: 1968Cr05 report branching=60 *17*.
6551.8		3937.3 *1*	100 *5*	2614.5	3⁻	
		6551.8 *2*	14 *1*	0.0		
6617.0	3⁻	2435.9 *3*	100 *5*	4180.9	5⁻	
		4002.7 *2*	95 *5*	2614.5	3⁻	
6657.1	4⁺	4042.6 *2*		2614.5	3⁻	
6682.3	(5⁻)	4067.8 *2*		2614.5	3⁻	
6692.0		2211.0 *5*		4481.0	6⁻	
6718.4	1⁻	6718.4 *3*		0.0		I_γ: 1968Cr05 report branching=6.7% 19.
6740.1	3⁻	2381.4 *1*		4358.7	4⁻	
6800.9		2504.2 *20*		4296.7	5⁻	
7062.1	1⁻	7062.1 *1*		0.0		
7082.7	1⁻	7082.7 *5*		0.0		I_γ: 1976Fr21 report branching=50% 13.
7241.4	1⁻	7241.4 *1*		0.0		
7316		7316[&] *8*		0.0		E_γ: 1976Fr21 report a level At 7316 *8* In (p,p′) and state that there is an indication of ground-state γ strength. The 7316 peak was separated from an ^{16}O contaminant In the (p,p′) data.

[†] The Iγ are from 1996Ra07. The Eγ are from 1997Ra17. 1996Ra07 studied (p,p′γ) and (d,pγ), but quote only one set of data for the two experiments. The revised Eγ data from 1997Ra17 are from a new (d,pγ) experiment. The Iγ are relative branching ratios

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^{208}Pb(p,p′γ),^{207}Pb(d,pγ) (continued)

γ(^{208}Pb) (continued)

from each level. Ground-state branching ratios have been determined for some transitions by 1981Di08 based on P′γ coincidence data and σ data of 1967Mo25 In (p,p′). These values are given In comments.

‡ 1996Ra07 report a multiplet At Eγ=1222.2 *3* placed from the 4698 and 5923 levels. A comparison with branching In (d,pγ) for the 5923 level suggests that the placement from that level should Be nearly three times the value shown. Eγ for both placements are taken by the evaluator from the energy level difference.

From Iγ(822γ)/Iγ(588γ)=0.57 *8* In (d,pγ) and 0.64 *4* In (n,n′γ), compared with Iγ(588γ)/Iγ(822γ)=0.63 *5* here suggests that the intensities of the 821γ and 588γ should Be interchanged.

@ From Iγ(1160γ)/Iγ(884γ)=0.39 *7* In (d,pγ) and 0.37 *5* In (n,n′γ), compared with Iγ(884γ)/Iγ(1160γ)=0.20 *2* here suggests that the intensities of the 884γ and 1160γ should Be interchanged.

& Placement of transition in the level scheme is uncertain.

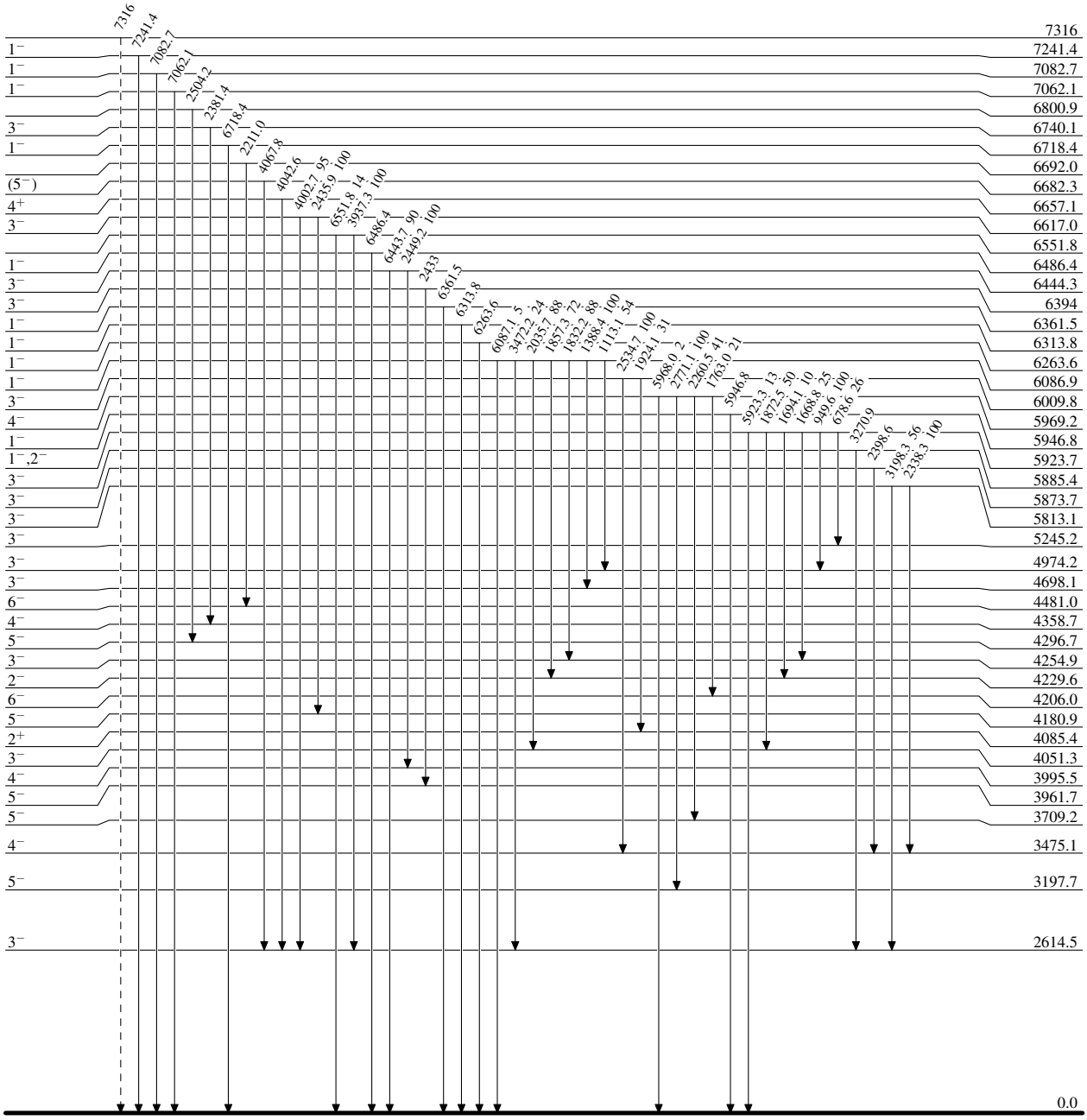
^{208}Pb(p,p′γ),^{207}Pb(d,pγ)

Legend

Level Scheme

Intensities: Relative photon branching from each level

– – – – – – ► γ Decay (Uncertain)



$^{208}_{82}Pb_{126}$

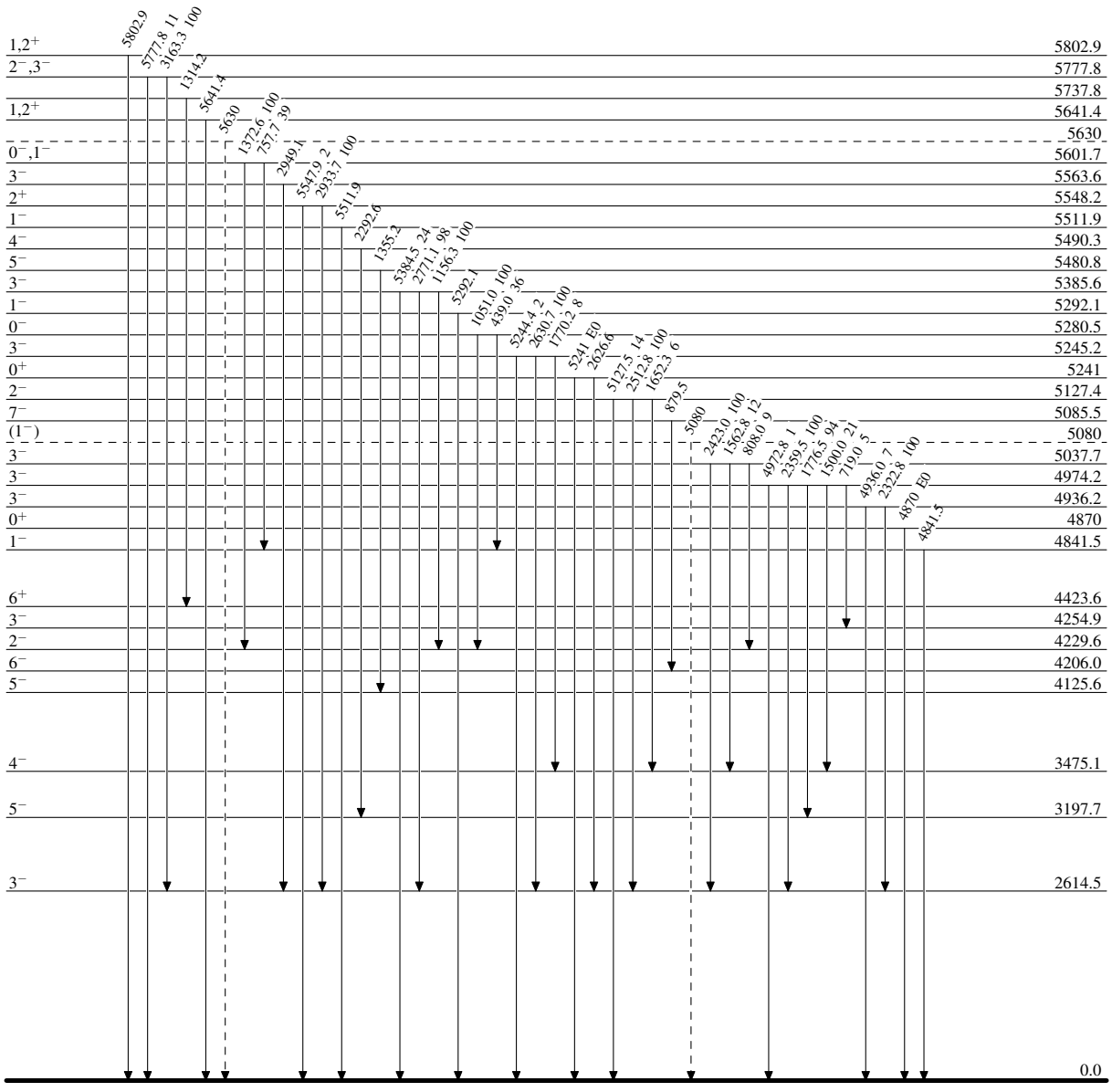
^{208}Pb(p,p′γ),^{207}Pb(d,pγ)

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)

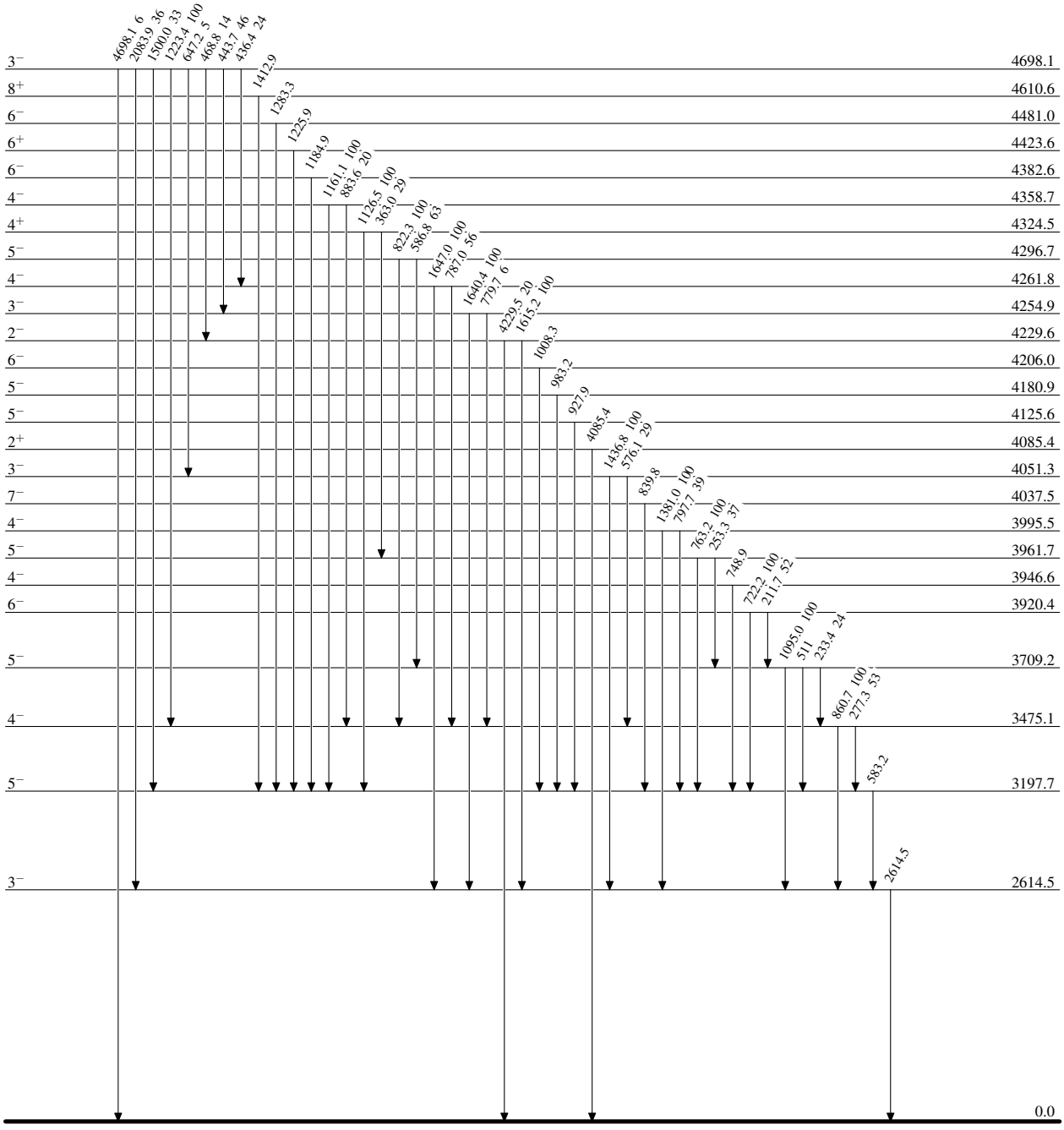


$^{208}_{82}Pb_{126}$

^{208}Pb(p,p′γ),^{207}Pb(d,pγ)

Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{208}_{82}Pb_{126}$