

$^{208}\text{Pb}(^7\text{Li},2n\gamma), ^{209}\text{Bi}(^{18}\text{O},^{14}\text{C}\gamma)$ 1980Sj01,1981Bo29

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	M. S. Basunia	NDS 181, 475 (2022)	1-Jan-2022

1980Sj01: $^{208}\text{Pb}(^7\text{Li},2n\gamma)$ E=30-34 MeV, (pulsed beam); measured: $E\gamma, I\gamma, E\alpha, \alpha\gamma, \gamma\gamma, \gamma(\theta)$.

1981Bo29: $^{209}\text{Bi}(^{18}\text{O},^{14}\text{C}\gamma)$ E=79 MeV (pulsed beam); measured: $E\alpha, E\gamma, T_{1/2}$. Level scheme was not presented.

Others:

2009Vi09 – $^{208}\text{Bi}(^9\text{Li},4n\gamma)$ – measured fusion cross section.

2013Vi01 – $^{208}\text{Bi}(^{11}\text{Li},^6n\gamma)$ – measured fusion cross section.

2015So17 – $^{206}\text{Pb}(^{18}\text{O},^{11}\text{B})$ – measured differential cross section $d\sigma/d\Omega=1.2$ mb/sr 3.

1980Me05: $^{208}\text{Pb}(^{16}\text{O},^{11}\text{B})$ E=140-312 MeV; population of continuum states was analyzed.

 ^{213}At Levels

E(level) [†]	$J^{\pi\ddagger}$	$T_{1/2}$	Comments
0.0	$9/2^-$	125 ns 6	Configuration: $\pi(h_{9/2}^{+1})$. $T_{1/2}$: From Adopted Levels.
340.5 3	$(7/2^-, 9/2^-)$	$\leq 5.5^{\#}$ ns	
724.6 3	$13/2^-$	$\leq 5.5^{\#}$ ns	Configuration: $\pi(h_{9/2}^{+1}\otimes 2^+)$.
1111.3 5	$15/2^-$	$\leq 5.5^{\#}$ ns	
1129.7 5	$(17/2^-)$	$\leq 5.5^{\#}$ ns	Configuration: $\pi(h_{9/2}^{+1}\otimes 4^+)$.
1318.1 6	$(19/2^-)$	$\leq 5.5^{\#}$ ns	
1318.1+x		110 ns 17	E(level): Other: 1358 23 (2021Ko07 – NUBASE). All gammas, except the 340.5-keV γ , had delayed components. The 386.7-, 405.1- and 724.6-keV gammas also showed prompt peak in their time spectra; however, existence of any prompt component in 188.4-keV γ could not be excluded (1980Sj01). The 110-ns state, therefore, is at or above 1318.1 keV. $T_{1/2}$: from $\tau=159$ ns 25 (386.7 γ)(t) (1980Sj01). The authors also measured (405 γ)(t) and obtained $\tau=163$ ns 14 for its ^{213}At component and $\tau=25$ ns 9 for the ^{212}Po component.

[†] Deduced by evaluator from a least square fit to the γ -ray energies.

[‡] Assignments are from 1980Sj01, based on γ -ray multipolarity deduced from $\gamma(\theta)$.

[#] From 1980Sj01.

 $\gamma(^{213}\text{At})$

E_γ [†]	I_γ [‡]	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult. [#]	α [@]	Comments
(18.4)		1129.7	$(17/2^-)$	1111.3	$15/2^-$			Transition was not observed. Its existence is inferred from the observed (188.4)(386.7 γ) coincidences (1980Sj01).
188.4 3	13 2	1318.1	$(19/2^-)$	1129.7	$(17/2^-)$	D		$A_2=-0.21$ 7 (1980Sj01) It was not possible to exclude the prompt component of 188.4 γ due to higher Compton background at this energy region (1980Sj01).
340.5 3	40 4	340.5	$(7/2^-, 9/2^-)$	0.0	$9/2^-$	(M1,E2)	0.24 15	$A_2=+0.14$ 4 (1980Sj01) $\alpha(\text{K})=0.18$ 14; $\alpha(\text{L})=0.043$ 14; $\alpha(\text{M})=0.0104$ 28 $\alpha(\text{N})=0.00270$ 72; $\alpha(\text{O})=5.7\times 10^{-4}$ 17; $\alpha(\text{P})=7.3\times 10^{-5}$ 28 E_γ : Other: 340.6 (1981Bo29).
386.7 3	27 3	1111.3	$15/2^-$	724.6	$13/2^-$	(M1+E2)	0.17 11	$A_2=-0.35$ 6 (1980Sj01) $\alpha(\text{K})=0.132$ 93; $\alpha(\text{L})=0.029$ 11; $\alpha(\text{M})=0.0071$ 23

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$^{208}\text{Pb}(7\text{Li},2n\gamma),^{209}\text{Bi}(^{18}\text{O},^{14}\text{C}\gamma)$ 1980Sj01,1981Bo29 (continued) $\gamma(^{213}\text{At})$ (continued)

<u>E_γ</u> [†]	<u>I_γ</u> [‡]	<u>$E_i(\text{level})$</u>	<u>J_i^π</u>	<u>E_f</u>	<u>J_f^π</u>	<u>Mult.</u> [#]	<u>α</u> [@]	<u>Comments</u>
405.1 3	33 9	1129.7	(17/2 ⁻)	724.6	13/2 ⁻	(E2)	0.0568	$\alpha(\text{N})=0.00183$ 59; $\alpha(\text{O})=3.8\times 10^{-4}$ 14; $\alpha(\text{P})=5.0\times 10^{-5}$ 22 E_γ : Other: 388.8 (1981Bo29). $A_2=+0.21$ 5 (1980Sj01 – for doublet) $\alpha(\text{K})=0.0354$ 5; $\alpha(\text{L})=0.01600$ 23; $\alpha(\text{M})=0.00410$ 6 $\alpha(\text{N})=0.001061$ 16; $\alpha(\text{O})=0.000215$ 3; $\alpha(\text{P})=2.49\times 10^{-5}$ 4 E_γ : Other: 405.1 (1981Bo29). I_γ : γ overlapped with 405-keV transition in ^{212}Po , and $I_\gamma=58$ was measured for the total peak. The ^{213}At and ^{212}Po components were deduced by 1980Sj01 from $\gamma\gamma$ -coincidence measurements.
724.6 3	100 10	724.6	13/2 ⁻	0.0	9/2 ⁻	(E2)	0.01473	$A_2=+0.28$ 5 (1980Sj01) $\alpha(\text{K})=0.01106$ 16; $\alpha(\text{L})=0.00278$ 4; $\alpha(\text{M})=0.000683$ 10 $\alpha(\text{N})=0.0001766$ 25; $\alpha(\text{O})=3.67\times 10^{-5}$ 6; $\alpha(\text{P})=4.64\times 10^{-6}$ 7 E_γ : Other: 725.2 (1981Bo29).

[†] From 1980Sj01. Assignments to ^{213}At were made from the observed (9.08-MeV α from ^{213}At g.s.)(γ) and $\gamma\gamma$ -coincidences.

[‡] Relative photon intensity, from 1980Sj01, normalized to $I_\gamma=100$ for 724.6 γ .

[#] From 1980Sj01 based on γ -ray angular distributions by assuming that the states were aligned and that the dominant γ rays proceed via yrast levels by stretched transitions. Lifetime information was considered to eliminate higher multiplicities. (M1,E2) multiplicities in 1980Sj01 are presented as (M1+E2) here.

[@] Additional information 1.

