^{9}Be(^{36}S,αpγ)   **1993Ba62,1988Ko05**

	Type	Author	History Citation	Literature Cutoff Date
	Full Evaluation	Jun Chen	NDS 140, 1 (2017)	30-Sep-2015

1993Ba62: E=105 MeV ^{36}S beam with an intensity up to 500 nA was produced from the University of Pennsylvania FN tandem
Van de Graaff accelerator. Target was a film of Be metal of thickness 500-750 mg/cm^2 evaporated onto a 32 mg/cm^2 Au backing.
Charged particles were detected with the Penn 4π array of 24 phoswich scintillators and γ rays were detected with Ge detectors.
Measured Eγ, Iγ, $\gamma\gamma$-coin, αp$\gamma\gamma$-coin, $\gamma\gamma(\theta)$. Deduced levels, J, π, γ-multipolarities.

1988Ko05: E=100 MeV ^{36}S beam was produced from the Argonne Tandem-Linac Accelerator System (ATLAS). Target was a
2.34 mg/cm^2 rolled Be foil on a 10 mg/cm^2 Pb backing. Charged particles were detected with two E-E Si surface barrier detector
telescopes and γ rays were detected with 8 Compton-suppressed Ge detectors in the Argonne-Notre Dame γ-ray facility. Measured
Eγ, Iγ, $\gamma(\theta)$, $\gamma\gamma$-coin, αpγ-coin. Deduced levels, J, π.

^{40}Cl Levels

A level at 900 proposed by 1988Ko05 has been omitted due to the revised placement of 219.52γ by 1993Ba62.

E(level)†	J$^{\pi\ddagger}$	T$_{1/2}$	E(level)†	J$^{\pi\ddagger}$	T$_{1/2}$	E(level)†	J$^{\pi\ddagger}$	T$_{1/2}$
0$^\&$	2$^-$		601.28$^\&$ 14	(4$^-$)	<7$^\#$ ns	2413.7 4	(6)	
211.60 13	(1$^-$)		680.95 17	(4$^-$)		2620.4$^\&$ 5	(7$^-$)	≤3.5$^@$ ps
244.03$^\&$ 8	(3$^-$)	<10$^\#$ ns	839.16$^\&$ 15	(5$^-$)		4087.1?$^\&$ 8	(8$^-$)	
367.1 4	(2)		2014.7$^\&$ 4	(6$^-$)	≤3.5$^@$ ps			
431.63? 21			2194.2 3	(5)				

† From a least-squares fit to γ-ray energies.

‡ For excited states, the assignments are based on $\gamma(\theta)$ data and comparison of experimental level structure with shell-model
calculations (particularly of 1989Wa09 and 1989Ji01). All assignments are given here under parentheses, although, some were
quoted without parentheses by 1993Ba62. Assignment for g.s. is from Adopted Levels.

$^\#$ From electronic timing (1993Ba62).

$^@$ From estimate of Doppler shift attenuation (1993Ba62).

$^\&$ Band(A): Yrast negative-parity structure. A multiplet (2$^-$ to 5$^-$) is expected from weak coupling of 3/2$^+$ g.s. of ^{37}Cl and 7/2$^-$
g.s. of ^{43}Ca.

γ(^{40}Cl)

Asymmetry ratio R=yield at 135°/yield at 90° (1993Ba62).

E$_\gamma$†	I$_\gamma$†	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Mult.	Comments
155.5 3	0.4 2	367.1	(2)	211.60	(1$^-$)		
157.8 3	3.0 2	839.16	(5$^-$)	680.95	(4$^-$)	(D)‡	Mult.: R(135°/90°)=0.84 17 (1993Ba62).
211.60 13	11.2 7	211.60	(1$^-$)	0	2$^-$	(D)‡	E$_\gamma$: weighted average of 211.55 13 from 1988Ko05 and 211.7 2 from 1993Ba62. I$_\gamma$: weighted average of 14 2 from 1988Ko05 and 11.0 5 from 1993Ba62. Mult.: R(135°/90°)=0.99 8 (1993Ba62).
219.53 13	9.1 5	2413.7	(6)	2194.2	(5)	(D)‡	Mult.: R(135°/90°)=0.67 6 (1993Ba62). E$_\gamma$: weighted average of 219.50 13 from 1988Ko05 and 219.6 2 from 1993Ba62. This γ was placed from a 900 level by 1988Ko05.

Continued on next page (footnotes at end of table)

$^9Be(^{36}S,\alpha p\gamma)$　　　1993Ba62,1988Ko05 (continued)

$\gamma(^{40}Cl)$ (continued)

E_γ[†]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	Comments
							I_γ: weighted average of 11 2 from 1988Ko05 and 9.0 5 from 1993Ba62.
237.93 9	31 1	839.16	(5^-)	601.28	(4^-)	(D)[‡]	E_γ: weighted average of 237.93 9 from 1988Ko05 and 237.9 2 from 1993Ba62.
							I_γ: weighted average of 34 3 from 1988Ko05 and 31 1 from 1993Ba62.
							Mult.: R(135°/90°)=0.83 5 (1993Ba62).
244.03 8	100 2	244.03	(3^-)	0	2^-	(D)[‡]	E_γ: weighted average of 244.04 8 from 1988Ko05 and 244.0 2 from 1993Ba62.
							I_γ: other: 100 7 from 1988Ko05.
							Mult.: R(135°/90°)=0.96 3 (1993Ba62).
[x]347							In coin with 244γ, 437γ and 220γ.
357.36 14	44 2	601.28	(4^-)	244.03	(3^-)	(D)[‡]	E_γ: weighted average of 357.29 14 from 1988Ko05 and 357.5 2 from 1993Ba62.
							I_γ: weighted average of 47 4 from 1988Ko05 and 43 2 from 1993Ba62.
							Mult.: R(135°/90°)=0.94 3 (1993Ba62).
431.63[#] 21	8 3	431.63?		0	2^-	(D)	E_γ: weighted average of 431.54 21 from 1988Ko05 and 431.8 3 from 1993Ba62. Placement proposed (by the evaluators) based on ^{40}S β^- decay. Unplaced in 1988Ko05 and 1993Ba62.
							I_γ: unweighted average of 5 2 from 1988Ko05 and 10 1 from 1993Ba62.
							Mult.: R(135°/90°)=0.99 10 (1993Ba62).
436.86 17	27 2	680.95	(4^-)	244.03	(3^-)	(D)[‡]	E_γ: weighted average of 436.76 17 from 1988Ko05 and 437.0 2 from 1993Ba62.
							I_γ: weighted average of 31 4 from 1988Ko05 and 26 2 from 1993Ba62.
							Mult.: R(135°/90°)=0.87 10 (1993Ba62).
594.9 4	2.3 5	839.16	(5^-)	244.03	(3^-)		
601.1 3	3.8 6	601.28	(4^-)	0	2^-		E_γ: weighted average of 601.30 28 from 1988Ko05 and 600.9 3 from 1993Ba62.
							I_γ: weighted average of 6 2 from 1988Ko05 and 3.7 5 from 1993Ba62.
605.4 6	3.3 10	2620.4	(7^-)	2014.7	(6^-)		
[x]676.7 3	3.2 5						R(135°/90°)=0.96 30.
							A 677.9γ is placed from an 888, 1^+ level in β^- decay, but it seems unlikely that a 1^+ level would be populated in $(^{36}S,\alpha p\gamma)$. Moreover a strong 889 transition from the same level seen in β^- decay is not reported in this reaction.
1175.4 3	7.1 20	2014.7	(6^-)	839.16	(5^-)		
1466.7[#] 6	1.0 7	4087.1?	(8^-)	2620.4	(7^-)		
1513.6 4	6.0 20	2194.2	(5)	680.95	(4^-)	(D)[‡]	Mult.: R(135°/90°)=0.7 3 (1993Ba62).
1592.5 4	2.5 5	2194.2	(5)	601.28	(4^-)		
1781.4 5	1.4 5	2620.4	(7^-)	839.16	(5^-)		
[x]2075	<0.6						

[†] From from 1993Ba62, unless otherwise stated.
[‡] $\gamma(\theta)$ data consistent with ΔJ=1, dipole (1993Ba62).
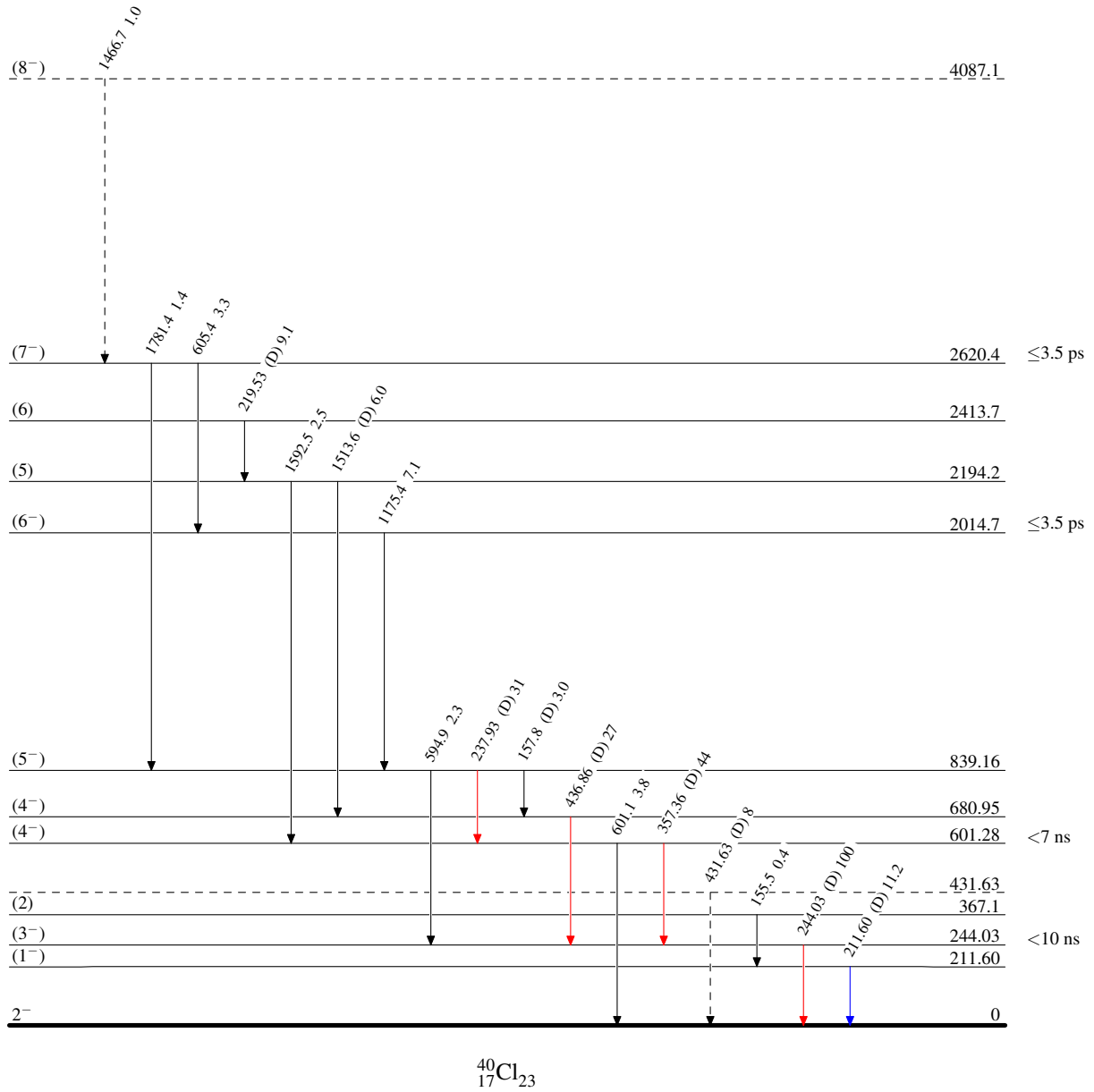[#] Placement of transition in the level scheme is uncertain.
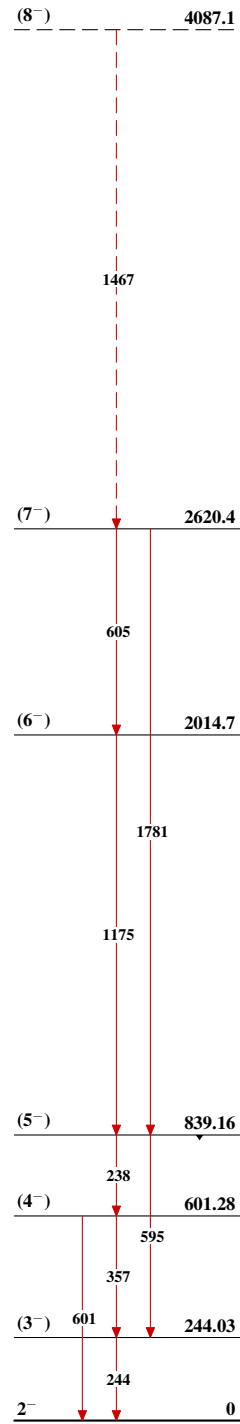[x] γ ray not placed in level scheme.

^{9}**Be(^{36}S,αpγ)** **1993Ba62,1988Ko05**

Legend

Level Scheme

Intensities: Relative I$_\gamma$

I$_\gamma$ < 2% × I$_\gamma^{max}$
I$_\gamma$ < 10% × I$_\gamma^{max}$
I$_\gamma$ > 10% × I$_\gamma^{max}$
γ Decay (Uncertain)

(8$^-$) 4087.1

1466.7 1.0

(7$^-$) 2620.4 ≤3.5 ps
(6) 2413.7
(5) 2194.2
(6$^-$) 2014.7 ≤3.5 ps

1781.4 1.4
605.4 3.3
219.53 (D) 9.1
1592.5 2.5
1513.6 (D) 6.0
1175.4 7.1

(5$^-$) 839.16
(4$^-$) 680.95
(4$^-$) 601.28 <7 ns
431.63
(2) 367.1
(3$^-$) 244.03 <10 ns
(1$^-$) 211.60

594.9 2.3
237.93 (D) 31
157.8 (D) 3.0
436.86 (D) 27
601.1 3.8
357.36 (D) 44
431.63 (D) 8
155.5 0.4
244.03 (D) 100
211.60 (D) 11.2

2$^-$ 0

${}^{40}_{17}$Cl$_{23}$

$^{9}Be(^{36}S,\alpha p\gamma)$ 1993Ba62,1988Ko05

Band(A): Yrast negative-parity structure

(8⁻) — — — — — — — 4087.1

1467

(7⁻)   2620.4

605

(6⁻)   2014.7

1781

1175

(5⁻)   839.16

238

(4⁻)   601.28

595

357

(3⁻)   601   244.03

244

2⁻   0

$^{40}_{17}Cl_{23}$