^{28}Si(^{28}Si,2$\alpha\gamma$) 1998Br34,1998Le43,1996Ca38

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 179, 1 (2022)	30-Nov-2021

1998Br34 (also 1998Br28,1998Le43): E=115 MeV ^{28}Si beam was produced from the Tandem XTU accelerator of the Legnaro National Laboratory. Target was 0.8 mg/cm^2 ^{28}Si on 15 mg/cm^2 Au backing. γ rays were detected with GASP array with 40 Compton-suppressed large volume Ge detectors and a BGO multiplicity filter with 80 elements. Measured Eγ, Iγ, $\gamma\gamma$-coin, Doppler-shift attenuation. Deduced levels, J, π, $T_{1/2}$, band structures, transition strengths.

1996Ca38: E=125 MeV ^{28}Si beam was produced from the Tandem Accelerator Super-Conducting Cyclotron (TASCC) facility at Chalk River Laboratories. Targets were self-supporting two 450 μg/cm^2 layers of natural Si (92% in ^{28}Si) or a 800 μg/cm^2 layer on a 13 mg/cm^2 gold backing. γ rays were detected with an 8π array of 20 Ge detectors and charged particles were detected with 44 CsI(Tl) detectors covering 94% of 4π allowed tagging of $\gamma\gamma$-coin by their particle signatures. Measured Eγ, Iγ, $\gamma\gamma$-coin, $\gamma\gamma(\theta)$(DCO), Doppler-shift attenuation. Deduced levels, J, π, band structure, $T_{1/2}$.

The level scheme is from 1998Br34 and 1998Le43.

^{48}Cr Levels

E(level)[†]	J$^\pi$[#]	$T_{1/2}$[a]	Comments
0.0[c]	0$^+$		
752.2[c] *3*	2$^+$		
1858.6[c] *4*	4$^+$	1.04 ps *35*	
3445.0[c] *5*	6$^+$	0.19 ps *5*	
3532.5[d] *8*	(4$^-$)		J$^\pi$: proposed by 1998Br34. The authors note that $\gamma(\theta)$ of 1973Ku10 (assigning 6$^+$) in ^{40}Ca(^{10}B,npγ) and 1975Ha04 (assigning 6$^+$) and 1979Ha45 (assigning 6$^-$) in ^{34}S(^{16}O,2nγ), which were interpreted as quadrupole, would also be consistent with ΔJ=0 dipole character and that negative parity is strongly suggested by systematics and 4$^-$ is from Shell-model prediction. Other: J=5 proposed by 1996Ca38.
4063.4[d] *8*	(5$^-$)[@]		J$^\pi$: 6 proposed in 1996Ca38.
4875.1[d] *8*	(6$^-$)[@]	>0.7 ps	
5188.5[c] *6*	8$^+$[&]	0.14 ps *4*	
5648.1[d] *8*	(7$^-$)[@]	0.42 ps *7*	
6257.5?[‡e] *12*	(9$^+$)		J$^\pi$: from 1998Le43 with no arguments.
6277.5? *13*		0.14 ps *3*	E(level): this level with J=8 proposed in 1996Ca38 only. It could be the same level as the 9871 level proposed by 1998Br34, which has the similar deexciting gamma and nearly identical $T_{1/2}$ from DSAM. $T_{1/2}$: from DSAM in 1996Ca38.
7063.9[c] *7*	10$^+$[&]	0.125 ps *35*	$T_{1/2}$: other: >0.7 ps from DSAM in 1996Ca38 is discrepant.
7670.4[d] *9*	(9$^-$)[@]	0.15 ps *5*	
8411.8[c] *7*	12$^+$[&]	0.59 ps *17*	$T_{1/2}$: unweighted average of 0.76 ps *11* (1998Br34) and 0.42 ps *7* (1996Ca38), both by DSAM.
8462.5?[‡e] *15*			
9870.5[d] *9*	(11$^-$)[@]	0.139 ps *35*	
10280.8[c] *8*	14$^+$[&]	0.30 ps *6*	$T_{1/2}$: unweighted average of 0.24 ps *4* (1998Br34) and 0.36 ps *3* (1996Ca38), both by DSAM.
11105.6?[‡e] *18*			
11648.0[d] *10*	(13$^-$)[@]	0.48[b] ps *14*	
12300.6?[‡d] *14*			
13309.9[c] *9*	16$^+$[&]	0.049[b] ps *10*	$T_{1/2}$: other: 0.048 ps *7* from Doppler shift measurement (1996Ca38).
15118.1?[‡d] *14*			
15735.1[c] *13*	(16$^+$)		J$^\pi$: from membership in band (1998Br34).

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^{28}Si(^{28}Si,2$\alpha\gamma$) 1998Br34,1998Le43,1996Ca38 (continued)

^{48}Cr Levels (continued)

E(level)[†]
17341.2?[‡][d] *17*
17379.1?[‡][c] *13*

[†] From a least-squares fit to γ-ray energies, assuming $\Delta E\gamma$=1 keV where not given.
[‡] Level from Fig.1 of 1998Le43; not discussed in 1998Br34.
[#] Assignments below 3533 level are from Adopted Levels and above that are proposed by 1998Le43 and 1996Ca38. When considered in Adopted Levels, the assignments listed as firm from this dataset will be placed inside parentheses if there is no firm experimental evidence.
[@] From band assignments and comparison of B(E2) to full fp spherical shell model calculations (1998Br34).
[&] From DCO ratios (1996Ca38), comparison of B(E2) to full fp spherical shell model calculations (1998Br34), and band assignments (1996Ca38,1998Br34). DCO ratios are not explicitly given in 1996Ca38.
[a] From DSAM line-shape analysis in 1998Br34, unless otherwise noted. Values from DSAM centroid-shift analysis in 1996Ca38 are also available for several levels as noted.
[b] Effective value (1998Br34).
[c] Band(A): g.s. (yrast) band (1996Ca38,1998Br34,1998Le43). See discussion in the Adopted Levels on location of the 8^+ state.
[d] Band(B): Rotational-like structure based on (4^-) (1998Br34,1998Le43). Possible $(d_{3/2})^1(f_{7/2})^9$ configuration.
[e] Band(C): Possible band based on (9^+) state (1998Le43).

γ(^{48}Cr)

E_γ[†]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	Comments
531.0 *3*	12 *1*	4063.4	(5^-)	3532.5	(4^-)		
752.2 *3*		752.2	2^+	0.0	0^+		E_γ: other: 752 (1996Ca38).
773.1 *3*	0.5 *1*	5648.1	(7^-)	4875.1	(6^-)		
811.9 *3*	1.1 *2*	4875.1	(6^-)	4063.4	(5^-)		
1069[#&]		6257.5?	(9^+)	5188.5	8^+		
1106.4 *3*	100	1858.6	4^+	752.2	2^+		E_γ: other: 1106 (1996Ca38).
1342.6 *3*	3.0 *5*	4875.1	(6^-)	3532.5	(4^-)		
1347.9 *3*	50 *2*	8411.8	12^+	7063.9	10^+	E2	E_γ: other: 1347 (1996Ca38).
1584.6 *3*	10 *1*	5648.1	(7^-)	4063.4	(5^-)		
1586.4 *3*	77 *3*	3445.0	6^+	1858.6	4^+		E_γ: other: 1587 (1996Ca38).
1674[‡]		3532.5	(4^-)	1858.6	4^+		
1743.4 *3*	71 *3*	5188.5	8^+	3445.0	6^+	E2	E_γ: other: 1744 (1996Ca38).
1777.4 *3*	3.2 *5*	11648.0	(13^-)	9870.5	(11^-)		
1868.9 *3*	44 *2*	10280.8	14^+	8411.8	12^+	E2	E_γ: other: 1872 (1996Ca38).
1875.4 *3*	54 *2*	7063.9	10^+	5188.5	8^+	E2	E_γ: other: 1875 (1996Ca38).
2022.2 *3*	7 *1*	7670.4	(9^-)	5648.1	(7^-)		E_γ: other: 2021 from 1996Ca38, placed from a 6085 level, which is not adopted by the evaluator.
2200.1 *3*	6 *1*	9870.5	(11^-)	7670.4	(9^-)		
2205[#&]		8462.5?		6257.5?	(9^+)		
2214[&]		6277.5?		4063.4	(5^-)		E_γ: from 1996Ca38 only. It could correspond to the 2200γ from 9871 level see in 1998Br34.
2223[#&]		17341.2?		15118.1?			
2430[#&]		12300.6?		9870.5	(11^-)		
2643[#&]		11105.6?		8462.5?			
2780[‡]		3532.5	(4^-)	752.2	2^+		
3029.0 *3*	22 *1*	13309.9	16^+	10280.8	14^+	E2	E_γ: other: 3032 (1996Ca38).

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^{28}Si(^{28}Si,2$\alpha\gamma$) 1998Br34,1998Le43,1996Ca38 (continued)

$\gamma(^{48}Cr)$ (continued)

E_γ [†]	E_i(level)	J_i^π	E_f	J_f^π	Comments
3470[#&]	15118.1?		11648.0	(13^-)	
4069[#&]	17379.1?		13309.9	16^+	
5454[‡]	15735.1	(16^+)	10280.8	14^+	E_γ: other: 5450 (1998Le43).

[†] From 1998Br34, unless otherwise noted.
[‡] From Fig. 1 of 1998Br34; not given in table 1.
[#] From Fig. 1 of 1998Le43; not discussed in 1998Br34.
[@] Q from $\gamma\gamma$(DCO) from 1996Ca38 and M2 ruled out by RUL. DCO ratios and Mult=Q assignments are not explicitly given in 1996Ca38, but Mult=Q is indicated by spin assignments by 1996Ca38 based on DCO ratios.
[&] Placement of transition in the level scheme is uncertain.

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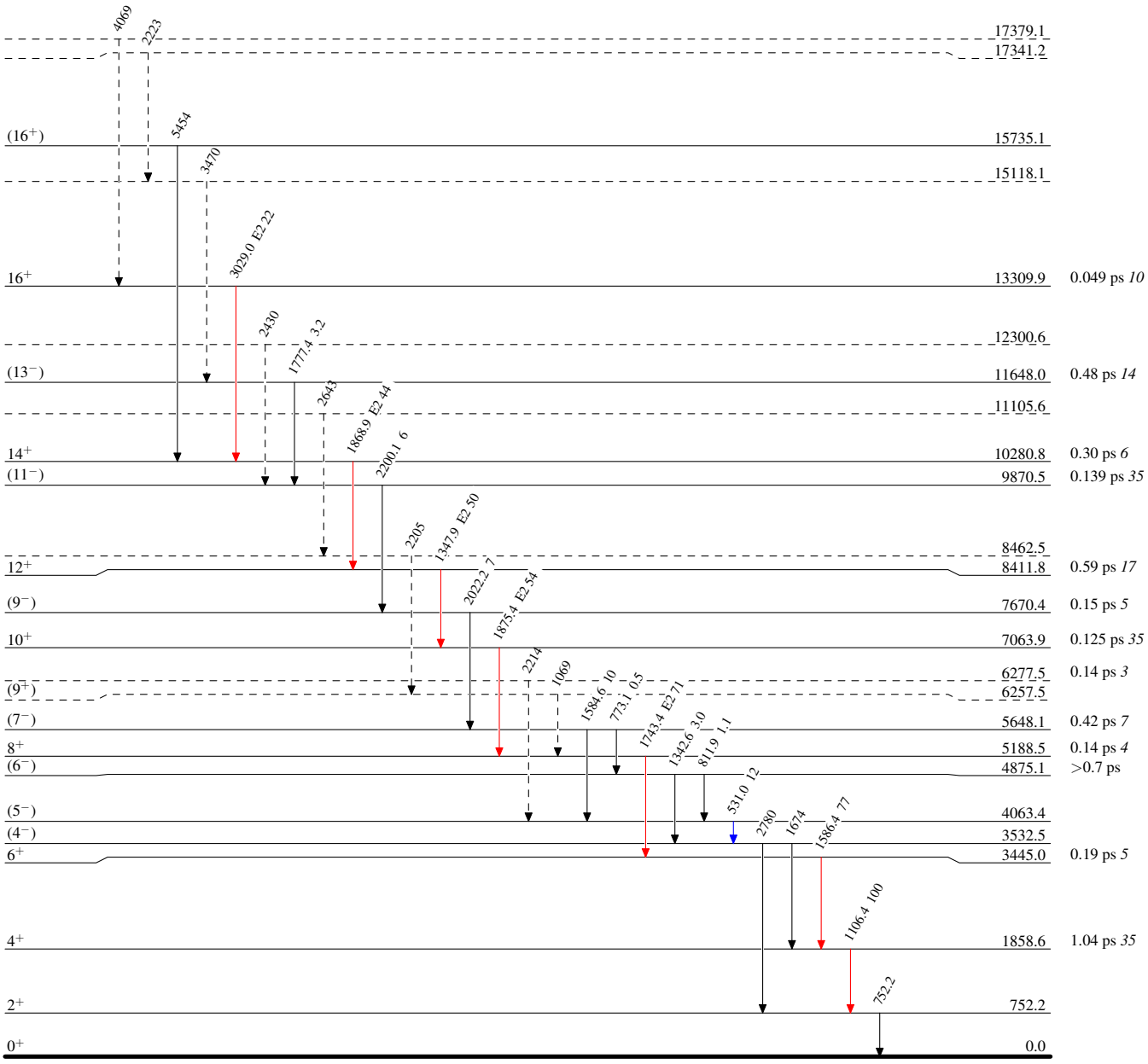
Level Scheme

Intensities: Relative I_γ

Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)



$^{48}_{24}Cr_{24}$

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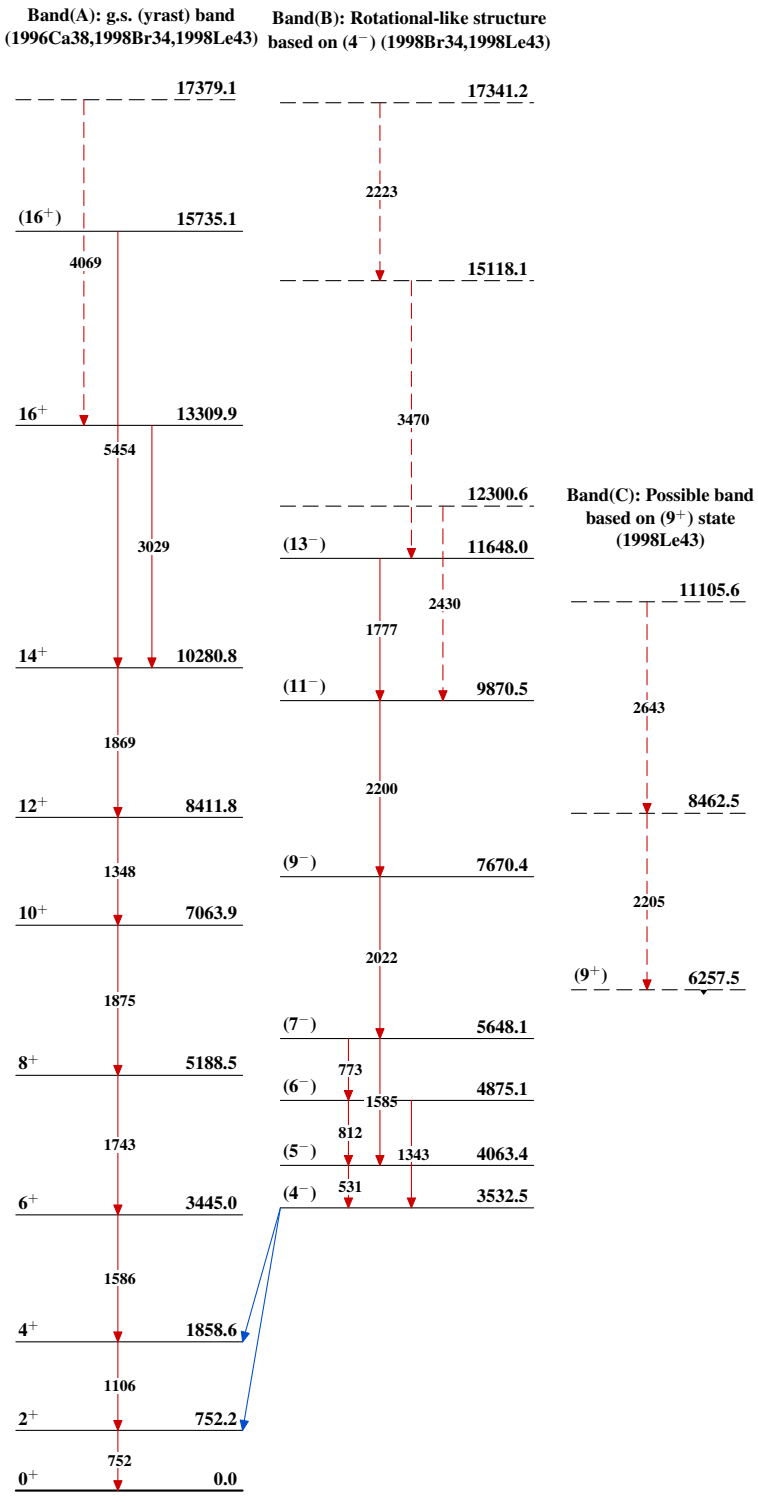

$^{48}_{24}Cr_{24}$