^{28}Si(^{16}O,2pγ) 1978Eg02,1976Ro06

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen# and Balraj Singh	NDS 135, 1 (2016)	31-May-2016

Includes ^{12}C(^{32}S,2pγ) from 1987TaZY.

1978Eg02: E=45 MeV ^{16}O beam was produced at the Utrecht EN tandem accelerator. A target of 250 μg/cm^2 ^{28}Si enriched to 99.91% on a 20 μm Au backing. γ-rays were detected with a NaI(Tl) Compton suppression spectrometer (CSS) and an array of three Ge(Li) detectors of about 25% efficiency. Measured Eγ, Iγ, $\gamma\gamma$, $\gamma(\theta)$, γ(lin pol). Deduced levels, J^π, mixing ratios.

1976Ro06: E=36-42 MeV ^{16}O beam was produced from the Oak Ridge tandem Van de Graaff accelerator. A natural target of 0.7 mg/cm^2 Si on a thick Pt backing. γ-rays were detected with Ge(Li) detectors. Measured Eγ, Iγ, $\gamma\gamma$, $\gamma\gamma(\theta)$, $\gamma(\theta)$. Deduced levels, J^π, mixing ratios, γ-branchings, transition probabilities.

1975Wu01 (also 1974Li06): E=36.5-50 MeV ^{16}O beam was produced from from the Van de Graaff tandem accelerator of the University of Cologne. A natural target of 150-200 μg/cm^2 Si layer evaporated onto stretched target foils of 1 μm Au or Ni. γ-rays were detected with 55-85 cm^3 Ge(Li) detectors, FWHM=3 keV at 1.33 MeV. Measured Eγ, lifetimes by recoil-distance method.

1975Uh02: E=32.5 MeV. Measured γ by $\gamma(\theta$,H,t).

1980Da22 (also 1983Da12): E=40 MeV. Measured average γ multiplicity.

1987TaZY: ^{12}C(^{32}S,2pγ) E=75 MeV. Measured g factor of high-spin states.

^{42}Ca Levels

E(level)†	J$^\pi$‡	T$_{1/2}$#	Comments
0.0	0$^+$		
1524.61 *8*	2$^+$		
2752.29 *12*	4$^+$	2.63@ ps *28*	
3189.37 *17*	6$^+$		
4099.58 *17*	5$^-$	<0.7 ps	
5491.19 *23*	6$^-$	<0.14& ps	J$^\pi$: 5$^+$ In 1976Ro06.
5744.29 *22*	7$^-$	10.5 ps *10*	J$^\pi$: 5$^-$ In 1976Ro06.
6144.96 *23*	7$^-$		J$^\pi$: 6$^+$ In 1976Ro06.
6408.79 *22*	8$^-$	31.0 ps *25*	J$^\pi$: 7$^+$ In 1976Ro06.
6553.82 *22*	9$^-$	44 ps *7*	J$^\pi$: 7$^-$ In 1976Ro06.
7368.3 *3*	(8,10)$^-$	1.5 ps *8*	J$^\pi$: 6$^-$,8$^-$ In 1976Ro06; 10$^-$ In Adopted Levels.
7750.5 *3*	(7,9,11)$^-$	<2.1[a] ps	J$^\pi$: 5$^-$ to 9$^-$ In 1976Ro06; (11)$^-$ in Adopted Levels.
8297.1 *4*	(7 to 11)$^-$		J$^\pi$: 11$^-$ in Adopted Levels.

† From least-squares fit to Eγ data.
‡ From γ(lin pol) and $\gamma(\theta)$ in 1978Eg02.
# From recoil-distance method (1975Wu01), unless otherwise stated.
@ From recoil-distance method (1974Li06).
& From DSA analysis (1975Wu01).
[a] From line shape analysis (1978Eg02).

γ(^{42}Ca)

E$_\gamma$†	I$_\gamma$†	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Mult.#	δ@	Comments
145.03 *10*	6.9 *3*	6553.82	9$^-$	6408.79	8$^-$	D(+Q)	0.00 *2*	A$_2$=−0.264 *16*; A$_4$=0 (1978Eg02) I$_\gamma$: Iγ(145.0)/Iγ(809.5)=28 *1*/72 *1*.
263.83 *8*	2.4 *1*	6408.79	8$^-$	6144.96	7$^-$	M1		A$_2$=−0.21 *3*; A$_4$=0 (1978Eg02) A$_2$=−0.09 *3*; A$_4$=−0.01 *3* (1976Ro06) Pol=−0.42 *11* (1978Eg02), −0.09 *4* (1976Ro06). I$_\gamma$: Iγ(263.8)/Iγ(917.6)/Iγ(3219.2)=15 *1*/73 *2*/12 *2*.

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^{28}Si(^{16}O,2pγ) 1978Eg02,1976Ro06 (continued)

γ(^{42}Ca) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[@]	Comments
382.20 *8*	6.0 *4*	7750.5	(7,9,11)$^-$	7368.3	(8,10)$^-$	M1		A_2=−0.23 *3*; A_4=0 (1978Eg02) Pol=−0.41 *5* (1978Eg02).
437.09 *15*	76 *3*	3189.37	6$^+$	2752.29	4$^+$	E2		A_2=+0.23 *3*; A_4=−0.08 *3* (1978Eg02) A_2=+0.264 *9*; A_4=−0.089 *9* (1976Ro06) Pol=+0.39 *3* (1978Eg02), +0.32 *5* (1976Ro06).
809.54 *15*	18.1 *4*	6553.82	9$^-$	5744.29	7$^-$	E2		A_2=+0.374 *17*; A_4=−0.147 *17* (1978Eg02) A_2=+0.38 *3*; A_4=−0.17 *5* (1976Ro06) Pol=+0.69 *4* (1978Eg02), +0.37 *8* (1976Ro06).
814.44 *15*	11.8 *4*	7368.3	(8,10)$^-$	6553.82	9$^-$	M1+E2		A_2=−0.150 *15*; A_4=0 (1978Eg02) A_2=−0.38 *5*; A_4=+0.24 *5* (1976Ro06) Pol=−0.37 *3* (1978Eg02), −0.41 *9* (1976Ro06).
910.21 *15*	8.2 *3*	4099.58	5$^-$	3189.37	6$^+$	E1(+M2)	+0.04[&] *2*	A_2=−0.152 *15*; A_4=0 (1978Eg02) A_2=−0.18 *3*; A_4=−0.01 *3* (1976Ro06) Pol=+0.21 *3* (1978Eg02), +0.19 *9* (1976Ro06).
917.59 *15*	11.5 *3*	6408.79	8$^-$	5491.19	6$^-$	E2		A_2=+0.336 *13*; A_4=−0.115 *14* (1978Eg02) A_2=+0.365 *19*; A_4=−0.12 *3* (1976Ro06) Pol=+0.63 *4* (1978Eg02), +0.41 *12* (1976Ro06).
928.84 *19*	3.8 *2*	8297.1	(7 to 11)$^-$	7368.3	(8,10)$^-$	M1+E2		A_2=+0.01 *5*; A_4=0 (1978Eg02) A_2=−0.67 *14*; A_4=+0.41 *15* (1976Ro06) Pol=−0.48 *9* (1978Eg02), −0.67 *27* (1976Ro06).
1227.66[‡] *8*	91.0 *20*	2752.29	4$^+$	1524.61	2$^+$	E2		A_2=+0.280 *10*; A_4=−0.085 *10* (1978Eg02) A_2=+0.262 *11*; A_4=−0.061 *13* (1976Ro06) Pol=+0.42 *2* (1978Eg02), +0.29 *6* (1976Ro06).
1347.26 *14*	4.9 *3*	4099.58	5$^-$	2752.29	4$^+$	E1+M2	−0.09[&] *4*	A_2=−0.25 *3*; A_4=0 (1978Eg02) A_2=−0.42 *7*; A_4=+0.10 *8* (1976Ro06) Pol=+0.27 *5* (1978Eg02), +0.05 *25* (1976Ro06).
1524.58[‡] *8*	100 *3*	1524.61	2$^+$	0.0	0$^+$	E2		A_2=+0.277 *10*; A_4=−0.093 *10* (1978Eg02) A_2=+0.285 *11*; A_4=−0.082 *17* (1976Ro06) Pol=+0.44 *2* (1978Eg02), +0.37 *9* (1976Ro06).
1644.7 *4*		5744.29	7$^-$	4099.58	5$^-$	E2		A_2=+0.29 *4*; A_4=−0.09 *4* (1976Ro06) E_γ: from $\gamma\gamma$. I_γ: Iγ(1644.7)/Iγ(2554.85)=57 *8*/43

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^{28}Si(^{16}O,2pγ) 1978Eg02,1976Ro06 (continued)

γ(^{42}Ca) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[@]	Comments
								8. Pol=+0.25 *29* (1976Ro06).
2301.75 *21*	11.9 *4*	5491.19	6$^-$	3189.37	6$^+$	E1		A_2=+0.470 *20*; A_4=0 (1978Eg02) A_2=+0.325 *16*; A_4=+0.055 *18* (1976Ro06) Pol=−0.30 *25* (1976Ro06).
2554.85 *21*	8.1 *3*	5744.29	7$^-$	3189.37	6$^+$	E1(+M2)	0.00 *+8−2*	A_2=−0.290 *20*; A_4=0 (1978Eg02) A_2=−0.33 *4*; A_4=+0.01 *4* (1976Ro06) Pol=+0.40 *10* (1978Eg02), −0.17 *30* (1976Ro06).
2955.5 *3*	2.4 *1*	6144.96	7$^-$	3189.37	6$^+$	E1		A_2=−0.25 *3*; A_4=0 (1978Eg02) A_2=−0.36 *8*; A_4=−0.01 *9* (1976Ro06) Pol=+0.40 *20* (1978Eg02).
3219.2 *3*	1.8 *2*	6408.79	8$^-$	3189.37	6$^+$	M2+E3	+0.8 *2*	A_2=+0.92 *3*; A_4=+0.36 *4* (1978Eg02) A_2=+0.76 *14*; A_4=+0.29 *15* (1976Ro06) Pol=−1.1 *6* (1978Eg02).

[†] From 1978Eg02. Values of Iγ for most γ rays are also available in 1976Ro06 and agree with those from 1978Eg02, but are somewhat less precise.
[‡] From 1975Wa04 in (^{18}O,2npγ). This energy used as a calibration line by 1978Eg02.
[#] Assigned by the evaluators based on $\gamma(\theta)$ and γ(lin pol) data.
[@] From 1978Eg02, unless otherwise stated. 1976Ro06 give δ values for almost all the transitions, but their J^π values differ from the values in Adopted Levels for all the levels above 4100 keV.
[&] From 1976Ro06.

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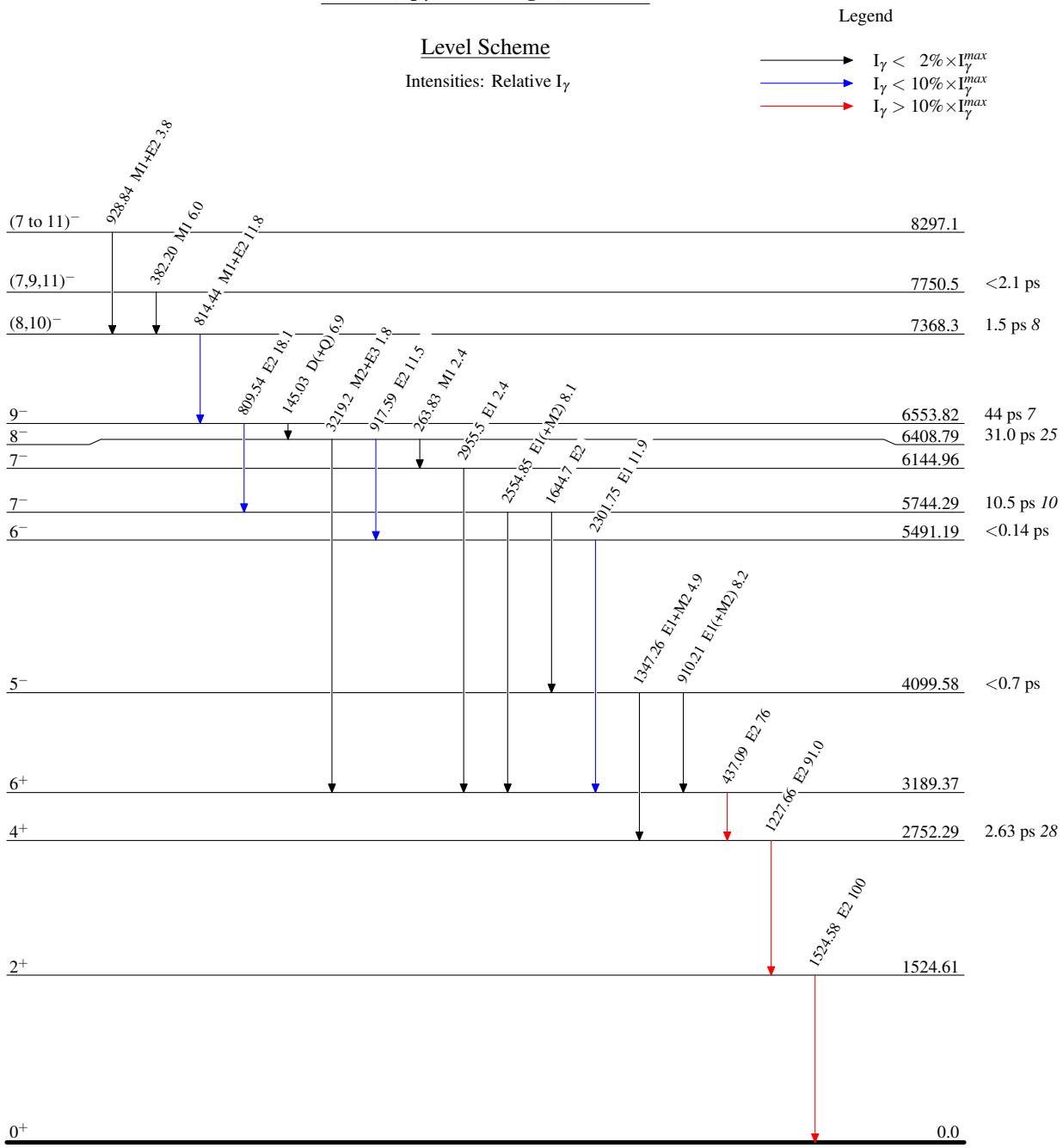
Level Scheme

Intensities: Relative I_γ



$^{42}_{20}Ca_{22}$