^{30}Si(t,pγ) 1974Gu11,1972Pr18

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 201,1 (2025)	31-Oct-2024

1974Gu11: E=2.5-3.3 MeV triton beams were produced from the Nuclear Science and Instrumentation Laboratory at Strasbourg. Target was 300 μg/cm^2 95.2% enriched ^{32}Si. γ rays were detected with a 100 cm^3 Ge(Li) detector. Measured Eγ, Iγ, p$\gamma(\theta)$, Doppler-shift attenuation. Deduced levels, J, π, $T_{1/2}$, γ-ray multipolarities, mixing ratios, branching ratios. Comparisons with available data.
Additional information 1.
1972Pr18: E=2.7 and 2.8 MeV triton beams were produced from the Lockheed 3.0-MV Van de Graaff accelerator at the Lockheed Palo Alto Research Laboratory. Target was 200 μg/cm^2 metallic Si (95.55% enriched). γ rays were detected with a Ge(Li) detector. Measured Eγ, p$\gamma(\theta)$, Doppler-shift attenuation. Deduced levels, J, π, $T_{1/2}$, γ-ray multipolarities, mixing ratios, branching ratios.

^{32}Si Levels

E(level)[†]	J$^\pi$[‡]	$T_{1/2}$[@]	Comments
0.0	0^+		
1941.4 *3*	2^+	0.35 ps *7*	E(level): weighted average of 1941.4 *3* (1974Gu11) and 1942.5 *20* (1972Pr18). $T_{1/2}$: weighted average of 0.64 ps *22* (1972Pr18) and 0.33 ps *5* (1974Gu11).
4232 *4*	2^+	0.26 ps *9*	E(level): weighted average of 4230 *4* (1974Gu11) and 4234 *4* (1972Pr18). J$^\pi$: 2 in 1974Gu11 and 1972Pr18 based on p$\gamma(\theta)$; parity from 2289γ M1+E2 to 2^+ level.
4984 *4*	(0^+)	≤0.30 ps	E(level): weighted average of 4982 *4* (1974Gu11) and 4985 *4* (1972Pr18). J$^\pi$: other: (0,1,2) in 1972Pr18. 0^+ in Adopted Levels. Iγ<4 relative to 100 for 3041 for Eγ=4982 in 1974Gu11, consistent with expected nonobservation of E0 transition as a γ ray.
5220 *3*	(1 to 4)	<80[&] fs	E(level): weighted average of 5220 *3* (1974Gu11) and 5222 *7* (1972Pr18). J$^\pi$: other: >1 in 1972Pr18. (1^+) in Adopted Levels.
5288.9 *8*	$3^{(-)}$[#]	128 fs *28*	E(level): weighted average of 5288.8 *8* (1974Gu11) and 5290 *3* (1972Pr18). J$^\pi$: other: 3 in 1972Pr18. 3^- in Adopted Levels. $T_{1/2}$: weighted average of 118 fs *28* (1974Gu11) and 187 fs *69* (1972Pr18).
5412.5 *9*	$1^{(-)}$[#]	<49 fs	E(level): weighted average of 5412.4 *9* (1974Gu11) and 5413 *3* (1972Pr18). J$^\pi$: other: 1 in 1972Pr18. $T_{1/2}$: <49 fs (1974Gu11), ≤51 fs (1972Pr18).
5502 *4*			E(level): from 1974Gu11. Other: 5499 (1972Pr18).
5773 *3*	(1,2,3)	<139 fs	E(level): weighted average of 5774 *4* (1974Gu11) and 5772 *3* (1972Pr18). $T_{1/2}$: <139 fs (1974Gu11 and 1972Pr18).
5791 *3*	$(0,1,2)^+$	≥0.83 ps	E(level): weighted average of 5792 *4* (1974Gu11) and 5790 *3* (1972Pr18). $T_{1/2}$: other: >0.55 ps (1974Gu11).
5955 *3*	2	≤55 fs	E(level): weighted average of 5953 *3* (1974Gu11) and 5956 *3* (1972Pr18). J$^\pi$: 2^+ in Adopted Levels. $T_{1/2}$: other: <69 fs (1974Gu11).
6170 *5*		≤55 fs	E(level): from 1972Pr18.
6196 *5*	1	≤38 fs	E(level): weighted average of 6195 *5* (1974Gu11) and 6196 *5* (1972Pr18). J$^\pi$: 1^- in Adopted Levels.
6242 *5*		≤55 fs	E(level): from 1972Pr18.
6388 *5*	2	<42[&] fs	E(level): weighted average of 6391 *5* (1974Gu11) and 6385 *5* (1972Pr18). J$^\pi$: 2^+ in Adopted Levels. $T_{1/2}$: other: ≤50 fs (1972Pr18).
6705 *6*	1		E(level): from 1974Gu11 only. J$^\pi$: 1^- in Adopted Levels.

[†] From 1974Gu11 and/or 1972Pr18; weighted average is taken when values are available from both. Level energies in both studies are deduced based on measured γ-ray energies, which however are not explicitly listed in both work.

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^{30}Si(t,pγ) 1974Gu11,1972Pr18 (continued)

^{32}Si Levels (continued)

‡ As proposed in 1974Gu11 for excited levels, based on measured p$\gamma(\theta)$ and deduced magnetic/electric nature where available, unless otherwise noted. Assignments from Adopted Levels are given under comments if different.
# Natural parity suggested by 1974Gu11 based on observed strong relative excitation at θ=0° and 180°.
@ From DSAM in 1972Pr18, unless otherwise noted.
& From DSAM in 1974Gu11.

$\gamma(^{32}Si)$

Values of A_2 and A_4 are from p$\gamma(\theta)$ correlations, gating on protons corresponding to associated levels.

E_i(level)	J_i^π	E_γ†	I_γ‡	E_f	J_f^π	Mult.@	δ@	Comments
1941.4	2^+	1941.4	100	0.0	0^+	E2		A_2=+0.63 *7*; A_4=−1.07 *10* (1974Gu11) A_2=+0.67 *14*; A_4=−1.42 *15* (1972Pr18)
4232	2^+	2289	38 *4*	1941.4	2^+	M1+E2	−0.84 *44*	A_2=−0.10 *11*; A_4=−0.28 *11* (1972Pr18) I_γ: weighted average of 34 *4* (1974Gu11) and 41 *3* (1972Pr18). δ: from 1972Pr18.
		4230	62 *4*	0.0	0^+	(E2)		A_2=+0.81 *10*; A_4=−1.80 *10* (1972Pr18) Mult.: (Q) assigned by the evaluator based on $\gamma(\theta)$ in 1972Pr18; (M2) ruled out by RUL. I_γ: weighted average of 66 *4* (1974Gu11) and 59 *3* (1972Pr18).
4984	(0^+)	3041	100	1941.4	2^+			A_2=+0.05 *10*; A_4=+0.10 *10* (1974Gu11) A_2=+0.02 *6*; A_4=+0.08 *6* (1972Pr18) δ: −0.30 *16* (1972Pr18) for $J^\pi(4983)=2^+$.
5220	(1 to 4)	990&	<1	4232	2^+			
		3278	100	1941.4	2^+			A_2=+0.30 *12*; A_4=+0.12 *13* (1974Gu11) A_2=+0.26 *4*; A_4=+0.11 *5* (1972Pr18)
		5219&	<2	0.0	0^+			
5288.9	$3^{(-)}$	1057.9	11 *4*	4232	2^+	D(+Q)	0.0 *2*	A_2=−0.44 *20*; A_4=+0.12 *20* (1974Gu11) I_γ: weighted average of 12 *4* (1974Gu11) and 10 *4* (1972Pr18). δ: from 1974Gu11.
		3347.1	89 *4*	1941.4	2^+	D+Q	−0.06 *4*	A_2=−0.40 *7*; A_4=+0.04 *9* (1974Gu11) A_2=−0.18 *1*; A_4=−0.03 *1* (1972Pr18) I_γ: weighted average of 88 *4* (1974Gu11) and 90 *4* (1972Pr18). δ: weighted average of −0.07 *4* (1972Pr18) and −0.03 *7* (1974Gu11).
		5288.8&	<3	0.0	0^+			
5412.5	$1^{(-)}$	1181.5	9 *3*	4232	2^+			I_γ: weighted average of 11 *4* (1974Gu11) and 8 *3* (1972Pr18).
		3470.6	81 *3*	1941.4	2^+	D(+Q)	+0.13 *33*	A_2=+0.22 *12*; A_4=+0.09 *16* (1974Gu11) A_2=+0.10 *7*; A_4=−0.11 *7* (1972Pr18) δ: from 1972Pr18. δ: from 1972Pr18 for $J^\pi(5412)=1^-$. Other: 0.0 *6* (1974Gu11). I_γ: weighted average of 79 *3* (1974Gu11) and 83 *4* (1972Pr18).
		5411.9	10 *2*	0.0	0^+	D		A_2=+0.4 *5*; A_4=+0.3 *6* (1974Gu11) A_2=−0.21 *8*; A_4=−0.01 *8* (1972Pr18) I_γ: weighted average of 10 *2* (1974Gu11) and 9 *3* (1972Pr18).

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^{30}Si(t,pγ) 1974Gu11,1972Pr18 (continued)

γ(^{32}Si) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π	Mult.[@]	δ[@]	Comments
5502		1271[&]	<8	4232	2^+			
		3560	100	1941.4	2^+			
		5502[&]	<20	0.0	0^+			
5773	(1,2,3)	3831	100	1941.4	2^+	D+Q		A_2=−0.20 *8*; A_4=−0.08 *9* (1974Gu11)
5791	$(0,1,2)^+$	3851	100	1941.4	2^+			
5955	2	4012	74 *3*	1941.4	2^+	D(+Q)	−0.01 *6*	A_2=+0.50 *11*; A_4=−0.24 *13* (1974Gu11) A_2=+0.44 *3*; A_4=−0.06 *3* (1972Pr18) I_γ: weighted average of 72 *3* (1974Gu11) and 77 *3* (1972Pr18). δ: from 1972Pr18 for J^π(5955)=2^+. Other: +0.1 *2* (1974Gu11).
		5953	26 *3*	0.0	0^+	E2		A_2=+0.44 *12*; A_4=−0.92 *17* (1974Gu11) A_2=+0.55 *4*; A_4=−1.13 *4* (1972Pr18) I_γ: weighted average of 28 *3* (1974Gu11) and 23 *3* (1972Pr18).
6170		4229	[#]	1941.4	2^+			
6196	1	4254	64 *6*	1941.4	2^+			
		6195	36 *6*	0.0	0^+	D		A_2=−0.41 *8*; A_4=−0.08 *10* (1974Gu11) A_2=−0.31 *3*; A_4=−0.01 *3* (1972Pr18)
6242		4301	[#]	1941.4	2^+			
6388	2	2161	6 *1*	4232	2^+			
		4450	94 *1*	1941.4	2^+	D(+Q)	+0.04 *4*	A_2=+0.80 *8*; A_4=−0.17 *11* (1974Gu11) A_2=+0.46 *1*; A_4=−0.01 *1* (1972Pr18) δ: from 1972Pr18 for J^π(6388)=2^+. Other: +0.5 *2* (1974Gu11).
		6388[&]	<3	0.0	0^+			
6705	1	2474	17 *4*	4232	2^+			
		4763	7 *5*	1941.4	2^+			
		6705	76 *5*	0.0	0^+	D		A_2=−0.78 *11*; A_4=+0.17 *18* (1974Gu11)

[†] From level-energy differences. γ ray energies are not explicitly listed in 1974Gu11 and 1972Pr18.
[‡] From 1974Gu11, unless otherwise noted.
[#] Transition seen but branching ratio not known (1974Gu11,1972Pr18).
[@] From pγ(θ) in 1974Gu11 or 1972Pr18 as noted, with electric or magnetic nature determined by evaluators based on RUL and measured $T_{1/2}$.
[&] Placement of transition in the level scheme is uncertain.

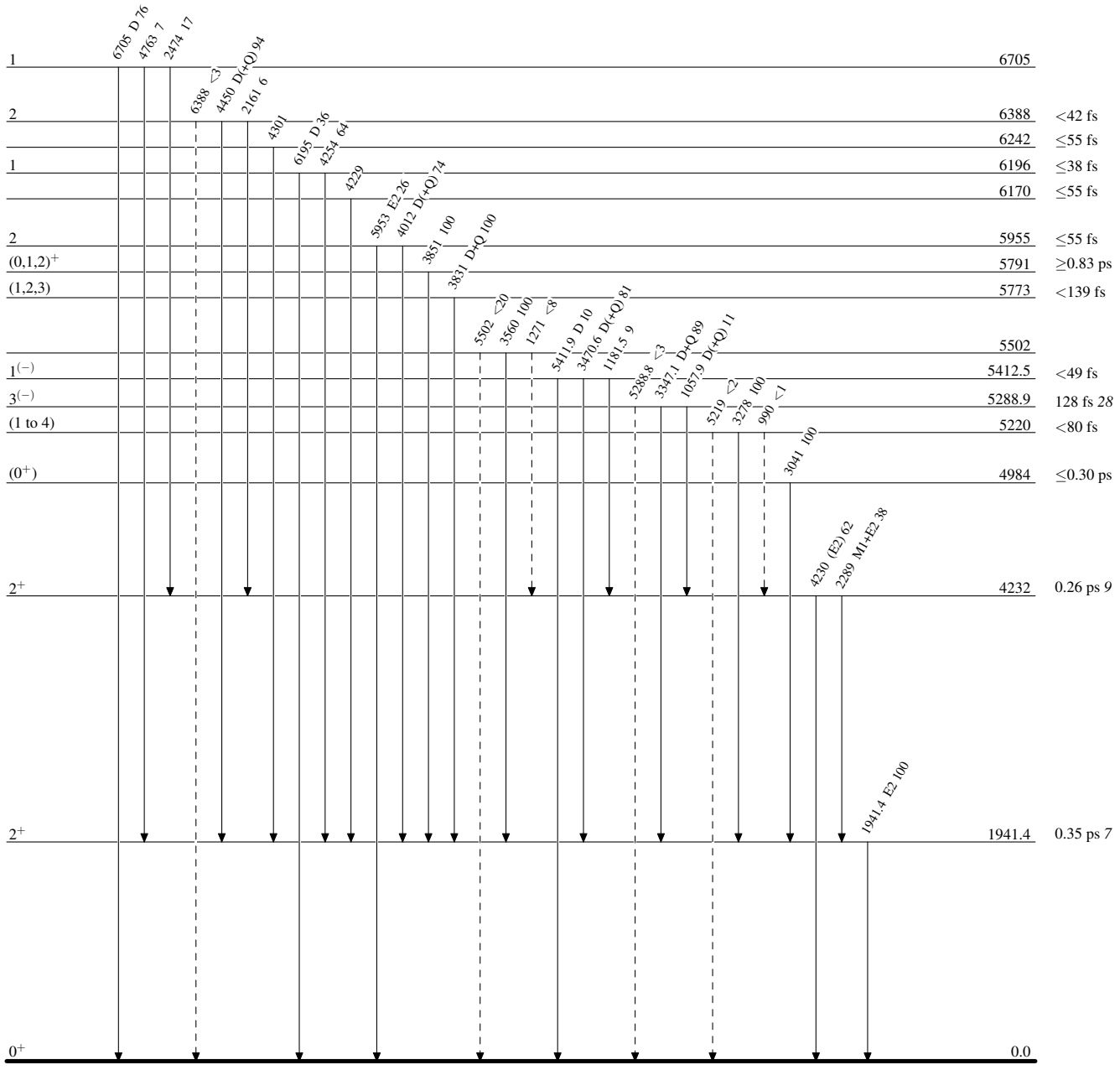
^{30}Si(t,pγ) 1974Gu11,1972Pr18

Legend

Level Scheme

Intensities: % photon branching from each level

- - - - - - ► γ Decay (Uncertain)



$^{32}_{14}Si_{18}$