^{32}S(p,p′γ) 1971In02,1966Po01

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

1971In02: E=9.275 MeV proton beam was produced from Chalk River MP tandem accelerator. Target was 383 μg/cm^2 natural sulphur on a gold backing. γ rays were detected with a Ge(Li) and a NaI(Tl) detectors and scattered protons were detected with a Si detector. Measured Eγ, Iγ, pγ-coin, γγ-coin, γγ(θ), Doppler-shift attenuation. Deduced levels, J, π, lifetimes, transition strengths. Comparisons with available data. A 10% systematic uncertainty is assumed due to incomplete knowledge of stopping power theory.

1966Po01: E=7.5-10.7 MeV proton beam was from Tandem Generator at Harwell. Target was 250 μg/cm^2 natural sulphur on a carbon backing. Protons were detected with an annular semi-conductor detector and γ rays were detected with a NaI(Tl) detector. Measured Eγ, Iγ, pγ(θ). Deduced levels, J, π, mixing ratios, branching ratios. See also 1982Go13 from the same lab for measurement of mixing ratios with E(p)=7.5 MeV.

1970Ol01: E=6.15-7.2 MeV protons were from Chalk River MP tandem accelerator. Targets were 22 mg/cm^2 PbS, 8 mg/cm^2 MoS_2, or 5 mg/cm^2 sulfur. γ rays were detected with a Compton suppressed Ge detector. Measured Eγ, Iγ, Doppler-shift attenuation. Deduced levels, lifetimes, branching ratios, transition strengths.

Others: 1960Ha21 (observed 2250 level), 1961Hi12, 1962Hu04, 1962Ta05, 1973Ga30.

^{32}S Levels

E(level)[†]	Jπ[‡]	$T_{1/2}$[#]	Comments
0	0^+		
2231.1 *9*	2^+	0.24 ps *4*	Additional information 1. Jπ: spin=2 from pγ(θ) in 1982Go13.
3779.9 *17*		0.69 ps *+21−14*	$T_{1/2}$: from 1970Ol01. Other: >0.52 ps (1971In02). Additional information 2.
4282.9 *12*	2^+	52 fs *4*	Additional information 3. $T_{1/2}$: weighted average of 55 fs *7* (1971In02) and 51 fs *4* (1970Ol01).
4460.6 *15*	4^+	0.15 ps *4*	Jπ: spin=4 from γγ(θ) in 1971In02. Additional information 4.
4696.4 *14*	1^+	0.32 ps *6*	Additional information 5. $T_{1/2}$: weighted average of 0.28 ps *7* (1971In02) and 0.34 ps *6* (1970Ol01).
5007.4 *15*		0.52 ps *4*	$T_{1/2}$: from 1970Ol01. Additional information 6.
5410 *20*	3^+	0.132 ps *14*	Additional information 7. E(level): from 1966Po01. $T_{1/2}$: from 1970Ol01.
5549.8 *22*	2^+	83 fs *21*	Additional information 8.
5799	1		Additional information 9. E(level): from 1966Po01.
6224.4 *22*	2	55 fs *14*	Additional information 10.
6440 *20*	(1,2,3,4)		Additional information 11. E(level): from 1966Po01.
6580			Additional information 12. E(level): from 1973Ga30.
6620			Additional information 13. E(level): from 1973Ga30.
6668.0 *27*		49 fs *21*	Additional information 14.
6762[@]			
6854[@]			
7004[@]			
7117[@]			

[†] From a least-squares fit to γ-ray energies, unless otherwise noted.

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^{32}S(p,p′γ) 1971In02,1966Po01 (continued)

^{32}S Levels (continued)

‡ For excited states, spin from pγ(θ) in 1966Po01 and parity from magnetic/electric nature of γ transition determined based on RUL where level lifetime is measured, unless otherwise noted.
# From DSAM in 1971In02, unless otherwise noted.
@ From 1973Mo06.

γ(^{32}S)

A_2 and A_4 values given under comments are for pγ(θ), unless otherwise noted.

E_i(level)	J_i^π	E_γ †	I_γ ‡	E_f	J_f^π	Mult.	δ ‡	Comments
2231.1	2+	2231.7 *10*	100	0	0+	E2		Mult.: Q from pγ(θ) (1982Go13); M2 ruled out by RUL. A_2=+0.64 *2*, A_4=−0.98 *2* (1982Go13).
3779.9		1548.8 *15*		2231.1	2+			
4282.9	2+	2052.6 *15*	14.5 *7*	2231.1	2+	E2+M1	−16 *+6−26*	I_γ: from 1971In02. Other: 11 *2* (1966Po01). Mult.: D+Q from pγ(θ) (1982Go13); M2 component ruled out by RUL. δ: from 1982Go13. Others: >+12 (1971In02), +1.4 *+4−14* (1966Po01). A_2=−0.31 *7*, A_4=+0.01 *10* (1966Po01). A_2=−0.23 *4*, A_4=−0.39 *5* (1982Go13).
		4281.8 *15*	89 *2*	0	0+	E2		I_γ: from 1971In02. Other: 89 *2* (1966Po01). Mult.: Q from pγ(θ) (1966Po01 and 1982Go13); M2 ruled out by RUL. A_2=+0.60 *2*, A_4=−0.83 *3* (1966Po01). A_2=+0.663 *7*, A_4=−1.34 *2* (1982Go13).
4460.6	4+	2229.4 *12*	100	2231.1	2+	E2		Mult.: Q, ΔJ=2 from γγ(θ) in 1971In02; M2 ruled out by RUL; also consistent with pγ(θ) in 1966Po01 and 1982Go13. A_2=+0.49 *4*, A_4=−0.08 *6*, for 2229γ+2232γ (1966Po01). A_2=+0.46 *4*, A_4=−0.24 *2*, for 2229γ+2232γ (1982Go13). A_2=+0.52 *13*, A_4=−0.39 *12* (1971In02).
		4460‡@	<0.5	0	0+			
4696.4	1+	2466.0 *15*	58 *3*	2231.1	2+	M1+E2	−0.47 *+15−23*	Mult.: D+Q from pγ(θ) (1966Po01 and 1982Go13); M2 component ruled out by RUL. δ: weighted average of −0.44 *+15−23* (1982Go13) and −0.65 *+27−58* (1966Po01). A_2=−0.33 *4* (1966Po01). A_2=−0.25 *3*, A_4=0.00 *4* (1982Go13).
		4694.0 *25*	42 *3*	0	0+			A_2=−0.36 *2* (1966Po01). A_2=−0.42 *6*, A_4=−0.05 *7* (1982Go13).
5007.4		2776.2 *12*		2231.1	2+			
		5012		0	0+			E_γ: from 1970Ol01.
5410	3+	1131@	<3	4282.9	2+			E_γ,I_γ: from 1973Mo06.
		1635@	<4	3779.9				E_γ,I_γ: from 1973Mo06.
		3170‡	96 *4*	2231.1	2+	E2(+M1)	>+19	Mult.,δ: Q(+D) from pγ(θ) (1966Po01 and 1982Go13); M2 ruled out by RUL. δ is from 1982Go13. Other: −12 *+5−36* (1966Po01).

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^{32}S(p,p′γ) 1971In02,1966Po01 (continued)

γ(^{32}S) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π	Mult.	δ[‡]	Comments
								A_2=+0.24 *3*, A_4=+0.39 *6* (1966Po01). A_2=+0.18 *11*, A_4=+0.69 *15* (1982Go13). I_γ: other: 100 (1973Mo06).
5410	3^+	5410[‡]	4 *4*	0	0^+			I_γ: other: <6 (1973Mo06).
5549.8	2^+	3318.5 *20*	60 *2*	2231.1	2^+	M1+E2	+0.55 *20*	I_γ: from 1973Mo06. Other: 58 *5* from 1966Po01. Mult.: D+Q from pγ(θ) in 1966Po01; M2 component ruled out by RUL. δ: or δ>+6 or <−6 (1966Po01). A_2=−0.19 *6*, A_4=−0.27 *9* (1966Po01). A_2=+0.18 *11*, A_4=+0.69 *15* (1982Go13).
		5550[‡]	40 *2*	0	0^+	E2		I_γ: from 1973Mo06. Other: 42 *5* from 1966Po01. Mult.: not given in 1966Po01, but γ(θ) data consistent with Q; M2 ruled out by RUL. A_2=+0.55 *4*, A_4=−0.80 *7* (1966Po01).
5799	1	3568[@]	<1	2231.1	2^+			E_γ,I_γ: from 1973Mo06.
		5800[‡]	100	0	0^+			A_2=−0.33 *5* (1966Po01).
6224.4	2	3993.0 *20*	100	2231.1	2^+	D(+Q)	+0.1 *1*	A_2=+0.29 *2*, A_4=+0.16 *8* (1966Po01).
		6225[‡@]	<1	0	0^+			I_γ: other: <6 (1973Mo06).
6440	(1,2,3,4)	4200[‡]	100	2231.1	2^+			A_2=+0.30 *9* (1966Po01).
		6440[‡@]	<5	0	0^+			I_γ: other: <4 (1973Mo06).
6580		4350		2231.1	2^+			E_γ: from 1973Ga30.
6620		1208[#@]	<3[#]	5410	3^+			
		1614[#]	81[#] *5*	5007.4				
		2162[#]	10[#] *3*	4460.6	4^+			
		4390[#]	9[#] *3*	2231.1	2^+			
		6620[@]		0	0^+			E_γ: from 1973Ga30.
6668.0		2887.9 *20*	47[#] *5*	3779.9				
		4436[#]	53[#] *5*	2231.1	2^+			
		6666[#@]	<6[#]	0	0^+			
6762		1755[#]	100[#]	5007.4				
		4532[#@]	<5[#]	2231.1	2^+			
		6762[#@]	<5[#]	0	0^+			
6854		1441[#]	9[#] *6*	5410	3^+			
		2395[#]	17[#] *7*	4460.6	4^+			
		2572[#]	74[#] *8*	4282.9	2^+			
		4624[#@]	<16[#]	2231.1	2^+			
		6854[#@]	<7[#]	0	0^+			
7004		2722[#@]	<3[#]	4282.9	2^+			
		3226[#@]	<3[#]	3779.9				
		4774[#]	100[#]	2231.1	2^+			
		7004[#@]	<7[#]	0	0^+			
7117		2658[#]	8[#] *4*	4460.6	4^+			
		2835[#@]	<5[#]	4282.9	2^+			
		3339[#@]	<3[#]	3779.9				

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^{32}S(p,p′γ) 1971In02,1966Po01 (continued)

γ(^{32}S) (continued)

E_i(level)	E_γ[†]	I_γ[‡]	E_f	J^π_f
7117	4887[#]	81[#] *4*	2231.1	2^+
	7117[#]	11[#] *3*	0	0^+

[†] From 1971In02, unless otherwise noted.
[‡] From 1966Po01, unless otherwise noted.
[#] From 1973Mo06.
[@] Placement of transition in the level scheme is uncertain.

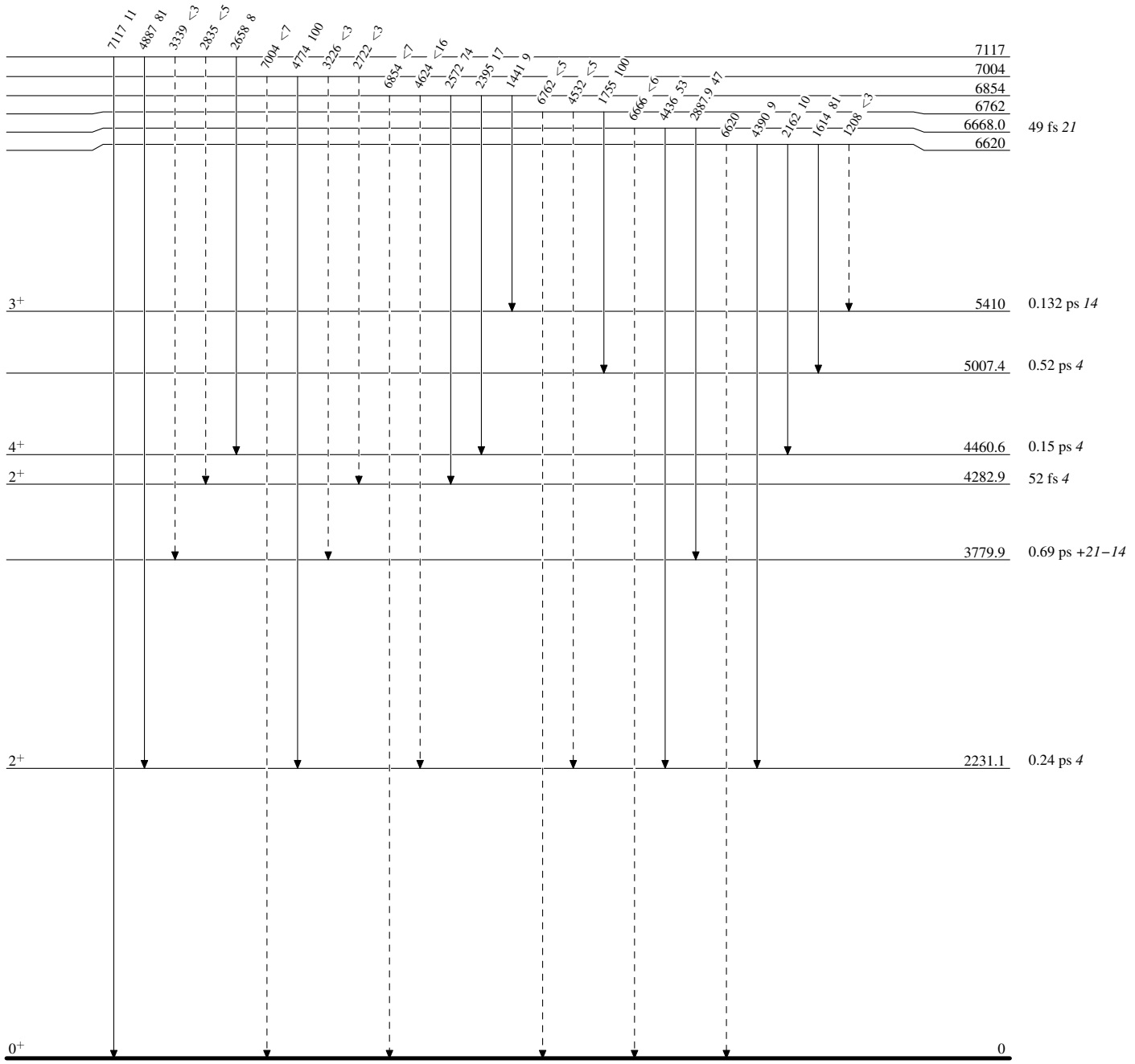
^{32}S(p,p′γ) 1971In02,1966Po01

Legend

Level Scheme

Intensities: % photon branching from each level

γ Decay (Uncertain)



$^{32}_{16}S_{16}$

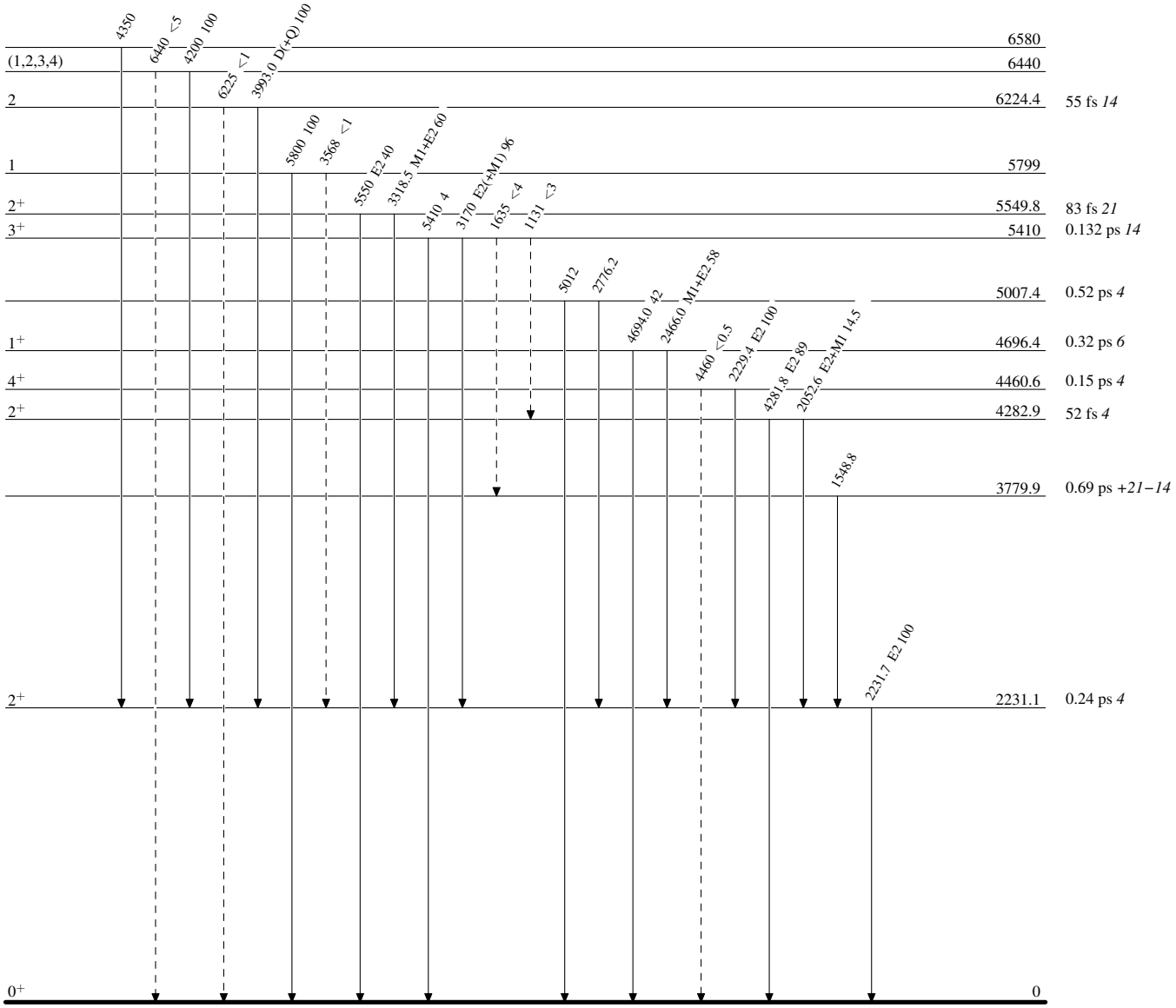
^{32}S(p,p′γ) 1971In02,1966Po01

Legend

Level Scheme (continued)

Intensities: % photon branching from each level

γ Decay (Uncertain)



$^{32}_{16}S_{16}$