^{32}S(p,γ) 1976Al01

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen and Balraj Singh	NDS 112, 1393 (2011)	31-Mar-2011

1976Al01: E_p=0.4-2.6 MeV from the 4 MV Van de Graaff accelerator at CENBG (beam resolution= 1 keV at 1750 keV). Targets: 15-120 μg/cm^2 Ag_2S (99.86% ^{32}S) targets. Detectors: a 12.7 by 12.7 cm NaI(Tl), a 60 cm^3 Ge(Li) and a 80 cm^3 Ge(Li). Measured Eγ,Iγ,$\gamma(\theta)$, $\sigma(E_p,E_\gamma,\theta)$. Measured lifetime using Doppler-Shift-Attenuation Method. Deduced Q=2276.5 keV *5*. Deduced levels, resonance strengths, γ-branchings, T, J^π,mixing ratios.

Others:

1958Va22, 1959Su55: E_p=300-830 keV proton beam. Proton energies determined by measuring the magnetic field of the analyzing magnet with a magnetic resonance fluxmeter. Targets: a 10 μg/cm^2 ZnS with natural sulphur. Measured $\sigma(E_p)$,$\gamma(\theta)$,Eγ,Iγ. Deduced levels,J^π,mixing ratio, resonance strength for 2856 and 2864 levels; S(p)=2289 keV *11*. Also 1956Van der Leun: Physica 22, 1234.

1961Hi12: E_p = up to 5.7 MeV proton beam produced from Osaka University 44 inch cyclotron. Natural sulphur target. Detectors: NaI(Tl) scintillators for gamma ray measurements. Measured $\sigma(E_p)$ Deduced levels of 6901, 7220, 7463 and 7706 keV. This experiment is mainly about gamma transitions from ^{32}S and ^{34}S.

1966En04: E_p=0.3 −2.1 MeV produced from the Utrecht 850 keV Cockcroft-Walton generator and the 3 MeV Van de Graaff accelerator. Various targets with Z=10-20 prepared by evaporation in vacuo onto 0.3 mm tantalum backings and used for the measurements of resonance strengths. Detectors: a cylindrical 10cm by 10cm NaI(Tl) scintillator. Measured yields, Eγ. Deduced level energy and resonance strength for the 2864 keV level.

1968Li07: E_p=1.75-2.3 MeV from the Van de Graaff accelerator of the University of Oslo. Targets made by evaporating Sb_2S_3 of natural isotopic composition onto backings of silver. Detectors: two 10.2 by 10.2 cm NaI(Tl) scintillation crystals. Measured γ yields, Eγ, Iγ $\gamma(\theta)$,$\gamma\gamma(\theta)$. Deduced levels, resonance strengths, J^π, mixing ratios, $\Gamma\gamma$ transition rates for three levels of 3977.8, 4111.7 and 4437.9 keV.

1972Bi19: E_p= 1.7-1.9 MeV from the 5.5 MV accelerator of the Laboratori Nazionali di Legnaro.Target: A thick silver sulphide on silver backing,99% enriched in ^{32}S. Detectors: a 40 cm^3 Ge(Li) counter. Measured T for the levels of 810 and 1985 KeV using Doppler Shift Attenuation Method. Deduced mixing ratio and transition rate for the transition from the 1985 KeV level.

1972Es02: E_p=3.36-5.41 MeV from the 5.5 MeV Van de Graaff accelerator at Trombay. Target: a water-cooled target of about 300 μg/cm^2 natural Sb_2S_3(95% ^{32}S) on a thick gold baking. Detectors: a 10-cm-diam 2.5-cm-thick plastic scintillator as a β detector and a 30-cm^3 Ge(Li) detector detecting γ-ray. Measured relative yield of ^{33}Cl activity, Eγ. Deduced levels, Γ. Deduced resonance strength for the levels of 5550,6990 and 7402 keV. Deduced branching ratio, transition rate and Γ(M1) for transitions from the 5550 keV level.

1974Al04: E_p=580 and 588 keV. Targets: 300 μg/cm^2 Ag_2S, CdS and ZnS. Detector: a 80 cm^3 Ge(Li). Measured gamma yield. Deduced level energies, branching ratio and resonance strength for the levels of 2839 and 2846 keV.

1974Ab06: $E_p\approx$3370 keV from the 5.5 MeV Van de Graaff accelerator of the Laboratori Nazionali di Legnaro. Overall resolution of 7.7(4) keV at E_p=3376 keV. Target: a 50μg/cm^2 natural Sb_2S_3 (95% ^{32}S) on thick Au backing. Detector: a Ge(Li) detector, 4.8 keV resolution at E_γ=1772 keV. Measured Eγ. Deduced mixing ratios and $\Gamma\gamma$ for the transitions from the level of 5544 keV.

1975Ke11: $E_p\approx$588 keV from the 2.5 mv Van de Graaff accelerator at the Helsinki University. Target: a 150 μg/cm^2 ZnS on a tantalum backing. Detector: a 120 cm^3 Ge(Li) (FWHM=2.9 keV at 2.8 MeV). Measured gamma yield. Deduced level energy and resonance strength for level of 2847 keV. Also strengths of analogue resonances for other sulphur isotopes.

1975VaYG: E=1.8-1.9 MeV proton beam of 4.5 μA produced from the Groningen 5 MV Van de Graaff generator. Targets of PbS (natural isotopic abundance), thickness of about 250 μg/cm^2, evaporated onto a tantalum backing. Detectors: a 10.2-cm by 10.2-cm NaI(Tl) and a 120 c.c. Ge(Li) detectors for detecting γ-rays. Measured Eγ, Iγ, $\gamma(\theta)$. Deduced J, resonance strength for the level of 4113 keV,

Additional information 1.

1992Il01: E_p=0.4-2.0 MeV from the 3 MV Pelletron tandem accelerator at the Kellogg Radiation Laboratory of the California Institute of Technology (FWHM=2 keV at 992 keV). Target: prepared by implanting ^{32}S ions into a 0.5 mm thick Ta-backing. Detectors: 35% Ge detector (FWHM=2 keV at 1.3 MeV). Measured gamma yield,Eγ,$\gamma(\theta)$. Deduced levels, resonance strengths, spectroscopic factors, branching ratios. Deduced astrophysical reaction rates.

2006Tr10: E_p up to 3.4 MeV with an intensity of 3 μA from the University of Washington FN tandem accelerator. Targets: a 2 mg/cm^2 Ag_2S and a 0.13 mg/cm^2 Ag_2S prepared by heating sulphur to Ag backings. Detector: a 50% efficient high-purity Ge detector. Measured Eγ,$\sigma(E_p)$. Deduced level energies for levels of 3971.1,3979.1, 4112.3,4439.1,4464.5 and 5548.5 keV. Deduced branching ratios for the transitions from the 3971 and 5548.5 keV levels.

^{32}S(p,γ) 1976Al01 (continued)

1970Sc16,1973Ta04: Measured activity of ^{33}Cl produced by (p,γ) reaction.
Other: 1959Va09.

^{33}Cl Levels

$S_{p\gamma}=(2J+1)\Gamma_p\Gamma_\gamma/\Gamma$. If given in different way in literature, the evaluators deduced the values using formula.
$S_{p\gamma}$ from 1976Al01, unless indicated otherwise.

E(level)[†]	Jπ[‡]	T or Γ[#]	E_p(lab) (keV)	Comments
0	3/2+	2.52 s *14*		Jπ: from Adopted Levels. T or Γ: from activity measurement (1972Es02). Other: 2.47 s *2* (1970Sc16), 2.513 s *4* (1973Ta04),2.53 s *2* (1958Mu05). $C^2S=\sigma$(theory)/σ(exp.)=0.84 *21* (1992Il01).
810.64 *22*	1/2+	>0.17 ps		E(level): from Eγ (1976Al01). Jπ: from Adopted Levels. T or Γ: from DSAM (1972Bi19). Γ_γ=3.7E−4 eV *6* (1976Al01). C^2S=0.28 *5* (1992Il01).
1986.4 *3*	5/2+	53 fs *11*		E(level): from Eγ (1976Al01). Jπ: γγ(θ)(3978-2000-0): A_2=+0.12 *7* and A_4=−0.01 *6* (1968Li07). T or Γ: weighted average from 1972Bi19 and 1976Al01. Γ_γ=0.011 eV *3* (1976Al01). C^2S<0.26 (1992Il01).
2351.81 *25*	3/2+	69 fs *21*		E(level): from Eγ (1976Al01). Γ_γ=0.007 eV *2* (1976Al01). $S_{p\gamma}=7.0\times10^{-34}$ eV (1992Il01). C^2S<0.66 (1992Il01).
2685.5 *3*	7/2−,(5/2−)		421.8 *6*	$S_{p\gamma}=9\times10^{-5}$ eV *4*. Other: 7.4×10^{-5} eV *16* (1992Il01). E_p deduced from level energy and Q-value (1976Al01). $\Gamma_\gamma=4\times10^{-6}$ eV *6* (1976Al01). C^2S<3.8 (1992Il01).
2838.95 *25*	5/2+	3 fs *1*	579.8 *6*	Jπ: from γ(θ) (1958Va22). $S_{p\gamma}$=0.027 eV *10* (1958Va22); 0.08 eV *1* (1974Al04,1976Al01). Γ_γ=0.14 eV *5* (1976Al01). C^2S<0.47 (1992Il01).
2846.33 *25*	3/2	≤0.7 fs	587.9 *6*	E(level): weighted average from 1958Va22, 1976Al01 and 1992Il01. Jπ: from γ(θ) (1958Va22). $S_{p\gamma}$=0.10 ev *4* (1958Va22); 0.14 eV *2* (1966En04); 0.21 eV *3*(1974Al04,1976Al01); 0.20 eV *4* (1975Ke11); 0.26 eV *6* (1992Il01). Γ_γ=0.07 eV *2* (1976Al01). C^2S=0.77 *13* (1992Il01).
2975.4 *3*	7/2+	60 fs *14*	720.7 *6*	E_p deduced from level energy and Q-value (1976Al01). $S_{p\gamma}=1.4\times10^{-4}$ eV *6*. $\Gamma_\gamma=7.7\times10^{-3}$ eV *18* (1976Al01).
3816.3 *3*	5/2+		1587.8 *11*	E(level): from Eγ (1976Al01). $S_{p\gamma}$=0.053 eV *7* (1976Al01); 0.054 eV *12* (1992Il01). Γ_γ>8.8E−3 eV (1976Al01).
3971.24 *19*	3/2+	≤0.3 keV	1748.4 *10*	E(level): weighted average from 1976Al01, 1992Il01 and 2006Tr10. Jπ: γ(θ): A_2=−0.255 *30*, A_4=+0.006 *30* (1968Li07); γγ(θ)(3998-810-0): A_2=−0.257 *50* and A_4=+0.018 *60* (1968Li07). T or Γ: from 2006Tr10. Others: Γ<0.6 keV (1968Li07); Γ=5 keV *3* (1976Al01). $S_{p\gamma}$=0.09 eV *2* (1976Al01); 0.36 eV *12*(1968Li07); 0.090 eV *18* (1992Il01). Γ_γ=0.023 eV *4* (1976Al01).

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^{32}S(p,γ) 1976Al01 (continued)

^{33}Cl Levels (continued)

E(level)[†]	J$^{\pi}$[‡]	T or Γ[#]	E$_p$(lab) (keV)	Comments
3979.31 *19*	5/2$^-$		1757.2 *9*	E(level): weighted average from 1976Al01 and 2006Tr10. S$_{p\gamma}$=0.38 eV *4* (1976Al01).
4099.5 *6*	(1/2$^+$,3/2,5/2$^+$)		1879.7 *11*	S$_{p\gamma}$=0.019 eV *8*.
4112.34 *20*	3/2$^{(+)}$	≤0.6 keV	1892.8 *7*	E(level): weighted average from 1968Li07,1976Al01 and 2006Tr10. J$^{\pi}$: $\gamma\gamma(\theta)$(4112-810-0): A$_2$=−0.281 *50*, A$_4$=−0.020 *60* (1968Li07). T or Γ: from 1968Li07. S$_{p\gamma}$=0.07 eV *2*; 0.22 eV *8*(1968Li07); 0.46 eV *15* (1975VaYG).
4117.5 *6*	3/2$^-$[a]	12 keV *3*	1898 *2*	E(level),T or Γ: weighted average from 1976Al01 and 1992Il01. S$_{p\gamma}$=0.19 eV *7* (1976Al01); 0.18 eV *8* (1992Il01).
4438.99 *19*		2 keV *1*	2229.4 *13*	E(level): average from 1968Li07,1976Al01 and 2006Tr10. S$_{p\gamma}$=0.30 eV *4*; 0.5 eV *2*(1968Li07). T or Γ: Other: Γ<1 keV (1968Li07).
4464.2 *4*			2255.4 *13*	E(level): weighted average from 1976Al01 and 2006Tr10. S$_{p\gamma}$=0.14 eV *2*.
4746.7 *4*			2547.2 *15*	S$_{p\gamma}$=1.4 eV *2*.
4775.4 *5*	7/2$^-$		2577 *3*	S$_{p\gamma}$=0.093 eV *19*.
5548.6 *5*	1/2$^+$[a]	≤2[@] keV		E(level): from 2006Tr10. E$_p$(lab) (keV): 3371 keV *5* (1972Es02); 3370 keV *8* (1974Ab06). S$_{p\gamma}$=0.76 eV *18*(1972Es02).
5694[@] *9*				
5879[@] *9*		15[@] keV		
6142[@] *9*		13[@] keV		
6198[@] *6*		≤10[@] keV		
6253[@] *6*		≤6[@] keV		
6308[@] *9*				
6629[@] *9*		33[@] keV		
6672[@] *9*				
6855[@] *9*				
6901[&]		[@]	4770	
6938[@] *9*				
6984[@] *9*				S$_{p\gamma}$<0.29 eV (1972Es02).
7221[&]			5100	
7280[@] *9*		29[@] keV		
7343[@] *9*				
7397[@] *6*		≤2[@] keV	5282 *6*	S$_{p\gamma}$=1.50 eV *37* (1972Es02).
7463[&]			5350	
7486[@] *6*		≤8[@] keV		
7706[&]			5600	

† From E$_{c.m.}$+S(p) where S(p)=2276.7 *5* from 2009AuZZ and E$_{c.m.}$ deduced from E$_p$(lab) (1976Al01), unless otherwise noted.
‡ From $\gamma(\theta)$ or/and $\gamma\gamma(\theta)$ in 1976Al01, unless indicated otherwise.
# From DSAM (1976Al01), unless indicated otherwise.
@ From 1972Es02.
& From 1961Hi12.
a From Adopted Levels.

$^{32}S(p,\gamma)$ 1976Al01 (continued)

$\gamma(^{33}Cl)$

Transition rates from 1976Al01, unless indicated otherwise.
BELW and BMLW are from authors′ values.

E_i(level)	J^π_i	E_γ‡	I_γ‡	E_f	J^π_f	Mult.‡	δ‡	Comments
810.64	1/2+	810.7 *3*	100	0	3/2+			A_2=+0.03 *3* (1958Va22). B(M1)(W.u.)<0.034$B(E2)(W.u.)<208 (1976Al01).
1986.4	5/2+	1175.8†	≤6	810.64	1/2+			
		1986.5 *4*	100	0	3/2+	M1+E2	+0.51 *6*	E_γ: from 1976Al01. $\gamma\gamma(\theta)$(3978-2000-0): A_2=+0.12 *7* and A_4=−0.01 *6* (1968Li07) Others: A_2=+0.35 *4*,A_4=−0.06 *3* (E_p=1588 keV, 1976Al01); A_2=+0.49 *16*,A_4=+0.29 *17* (E_p=2577 keV, 1976Al01). B(M1)(W.u.)=0.042 *8*$B(E2)(W.u.)=8.8 *31*,weighted average (1976Al01 and 1972Bi19). δ: Weighted average of +0.53 *6* (1976Al01) and +0.36 *15* (1972Bi19) Others: +4 *1*, giving B(M1)(W.u.)=4×10^{-3} *2* and B(E2)(W.u.)=65 *17* (1976Al01); Additional information 2.
2351.81	3/2+	1541.1†	74 *2*	810.64	1/2+	M1+E2	+0.44 *4*	A_2=+0.19 *5*,A_4=+0.05 *4* (1976Al01). B(M1)(W.u.)=0.058 *17*$B(E2)(W.u.)=19 *6* (1976Al01).
		2351.8 *3*	26 *2*	0	3/2+	M1+E2	−1.3 *4*	A_2=−0.43 *3*,A_4=−0.02 *3* (1976Al01). B(M1)(W.u.)=2.5×10^{-3} *12*$B(E2)(W.u.)=3.1 *11* (1976Al01).
2685.5	7/2−,(5/2−)	699.2†	69 *11*	1986.4	5/2+	E1+M2	−0.0 *6*	I_γ: weighted average from 1976Al01 and 1992Il01. B(E1)(W.u.)=4.4×10^{-5} *22* if J=7/2− (1976Al01). δ: Other: δ=+0.0 *6*, B(E1)(W.u.)=6×10^{-5} *3* if J=5/2− (1976Al01).
		1875†	≤10	810.64	1/2+			
		2685.5 *4*	31 *6*	0	3/2+			I_γ: weighted average from 1976Al01 and 1992Il01.
2838.95	5/2+	2028.3	1.0 *4*	810.64	1/2+			
		2839.0 *3*	99.0 *4*	0	3/2+	M1+E2	−0.10 *2*	A_2=−0.68 *2* (1958Va22). B(M1)(W.u.)=0.29 *8*, B(E2)(W.u.)=1.4 *7* (1976Al01). A_2=−0.51 *4*, A_4=+0.02 *4* (1976Al01). δ: Other: δ=+0.014 *8* (1958Va22); −0.09 *3* 1959Su55.
2846.33	3/2	2035 *15*	53 *4*	810.64	1/2+	D		E_γ: from 1958Va22. Eγ≈2035 keV from level-energy difference. I_γ: weighted average from 1958Va22, 1976Al01 and 1992Il01. Mult.: from 1958Va22. A_2=−0.61 *3* (1958Va22).
		2846.3 *3*	47 *4*	0	3/2+	D		I_γ: weighted average from 1958Va22, 1976Al01 and 1992Il01. Mult.: from 1958Va22. A_2=0.77 *4* (1958Va22).

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^{32}S(p,γ) 1976Al01 (continued)

γ(^{33}Cl) (continued)

E_i(level)	J^π_i	E_γ‡	I_γ‡	E_f	J^π_f	Mult.‡	δ‡	Comments
2975.4	7/2+	988.9†	15 *4*	1986.4	5/2+	M1+E2	+0.31 *3*	B(M1)(W.u.)=0.055 *2*$B(E2)(W.u.)=21 *8* (1976Al01).
		2975.4 *3*	85 *4*	0	3/2+	E2+M3	−0.09 *9*	A_2=+0.23 *10*,A_4=−0.11 *10* (1976Al01). B(E2)(W.u.)=3.6 *8* (1976Al01).
3816.3	5/2+	841†	8 *1*	2975.4	7/2+			
		977†	12 *2*	2838.95	5/2+	M1+E2	+0.47 *16*	A_2=+0.70 *5*, A_4=+0.02 *4* (1976Al01). B(M1)(W.u.)>0.046$B(E2)(W.u.)>42 (1976Al01).
		1464†	43 *3*	2351.81	3/2+	M1+E2	+0.17 *4*	A_2=+0.01 *11*, A_4=−0.03 *8* (1976Al01). B(M1)(W.u.)>0.6$B(E2)(W.u.)>3.3 (1976Al01).
		1830†	21 *3*	1986.4	5/2+	M1+E2	−0.22 *3*	A_2=+0.18 *2*, A_4=+0.03 *4* (1976Al01). B(M1)(W.u.)>0.014$B(E2)(W.u.)>0.9 (1976Al01).
		3005†	3 *1*	810.64	1/2+			
		3816.1 *3*	13 *2*	0	3/2+	M1+E2	−2.5 *3*	A_2=−0.58 *5*, A_4=−0.49 *5* (1976Al01). B(M1)(W.u.)>1.4×10^{-4}$B(E2)(W.u.)>0.23 (1976Al01).
3971.24	3/2+	1133†	8 *4*	2838.95	5/2+			I_γ: from 2006Tr10. Others: 8 *1* (1976Al01); 11 *3* (1992Il01).
		1620†	8 *2*	2351.81	3/2+			I_γ: from 2006Tr10. Others: 5 *3* (1976Al01); 9 *3* (1992Il01).
		1985†	16 *2*	1986.4	5/2+			E_γ: Eγ=2000 keV *20*,Iγ=6 *1* (1968Li07). I_γ: from 2006Tr10. Others: 16 *3* (1976Al01); 15 *3* (1992Il01).
		3161†	18 *2*	810.64	1/2+	M1+E2	−0.00 *2*	E_γ: Eγ=3190 keV *50*, Iγ=9 *2* (1968Li07). I_γ: from 2006Tr10. Others: 40 *4* (1976Al01); 39 *8* (1992Il01). B(M1)(W.u.)=0.014 *4* (1976Al01). δ: Others: δ=−1.73 *7*, giving B(M1)(W.u.)=3.4×10^{-3} *9* and B(E2)(W.u.)=4.1 *9* (1976Al01); δ=+2.3 *2* giving B(M1)(W.u.)=0.19×10^{-2}, B(E2)(W.u.)=40,Γγ(M1)=0.13×10^{-2} eV, Γγ(E2)=0.68×10^{-2} eV (1968Li07); δ=−0.11 *3* giving B(M1)(W.u.)=1.15×10^{-2}, B(E2)(W.u.)<1.2, Γγ(M1)=0.79×10^{-2} eV, Γγ(E2)<0.02×10^{-2} eV (1968Li07). A_2=−0.49 *3*, A_4=+0.09 *3* (1976Al01).
		3970.9 *2*	50 *3*	0	3/2+	M1+E2	+0.8 *5*	E_γ: from 2006Tr10. Other: Eγ=4000 keV *50*, Iγ=85 *3* (1968Li07). I_γ: from 2006Tr10. Others: 31 *4* (1976Al01); 26 *6* (1992Il01). A_2=+0.84 *8*, A_4=+0.05 *5* (1976Al01). B(M1)(W.u.)=3.3×10^{-3} *18*, B(E2)(W.u.)<1 (1976Al01). δ: others:+0.50 *4* giving B(M1)(W.u.)=4.56×10^{-2},B(E2)(W.u.)=2.89, Γγ(M1)=6.12×10^{-2} eV, Γγ(E2)=1.53×10^{-2} eV; +5.0 *8* giving B(M1)(W.u.)= 0.23×10^{-2},B(E2)(W.u.)=13.8, Γγ(M1)=0.31×10^{-2} eV, Γγ(E2)=7.34×10^{-2} eV (1968Li07).
3979.31	5/2−	1005†	0.3 *2*	2975.4	7/2+			
		1134†	2.2 *4*	2846.33	3/2	D+Q	−0.23 *8*	I_γ: Other: 4.7 *8* (1992Il01).

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^{32}S(p,γ) 1976Al01 (continued)

γ(^{33}Cl) (continued)

E_i(level)	J^π_i	E_γ‡	I_γ‡	E_f	J^π_f	Mult.‡	δ‡	Comments
								Mult.: M1+E2 in 1976Al01. A_2=−0.75 *8*,A_4=+0.04 *9* (1976Al01). B(M1)(W.u.)>0.047,B(E2)(W.u.)> 6 (1976Al01). δ: Other: δ=−1.3 *4*, giving B(M1)(W.u.)>0.018, B(E2)(W.u.)>90 (1976Al01). I_γ: Other: 4.7 *8*, energetically not resolved from transition to state at E_x=2839 keV (1992Il01).
3979.31	5/2⁻	1142†	1.2 *3*	2838.95	5/2⁺	E1+M2	−0.03 *15*	A_2=+0.40 *15*,A_4=−0.04 *13* (1976Al01). B(E1)(W.u.)>7.2×10⁻³ (1976Al01).
		1295.1†	2.3 *4*	2685.5	7/2⁻,(5/2⁻)	M1+E2	−7 *2*	I_γ: Other: 2.3 *5* (1992Il01). A_2=−0.49 *6*,A_4=+0.04 *6* (1976Al01). δ: obtained when J^π(Ex=2685)=7/2⁻, also δ=+0.25 *6* giving B(M1)(W.u.)>0.03, B(E2)(W.u.)>4 (1976Al01). δ: Other: δ=−0.9 *3* if J^π(Ex=2685)=5/2⁻, giving B(M1)(W.u.)>0.017, B(E2)(W.u.)>36 (1976Al01).
		1994†	3.5 *5*	1986.4	5/2⁺			I_γ: Other: 5.0 *8* (1992Il01).
		3978.8 *2*	90.5 *10*	0	3/2⁺	E1+M2	+0.01 *2*	E_γ: from 2006Tr10. I_γ: Other: 88 *13* (1992Il01). A_2=−0.42 *2*, A_4=+0.03 *2* (1976Al01). B(E1)(W.u.)>9×10⁻⁴ (1976Al01).
4099.5	(1/2⁺,3/2,5/2⁺)	1253†	4 *1*	2846.33	3/2			
		2113†	60 *4*	1986.4	5/2⁺			
		3289†	18 *3*	810.64	1/2⁺			
		4099†	18 *2*	0	3/2⁺			
4112.34	3/2⁽⁺⁾	1267†	(1)	2846.33	3/2			
		1761†	(1)	2351.81	3/2⁺			
		3280 *50*	50 *5*	810.64	1/2⁺	M1+E2	−0.10 *5*	E_γ: from 1968Li07. Eγ=3303 keV from level energy difference. I_γ,Mult.: from 1968Li07. Γγ(M1)=2.75×10⁻² eV, Γγ(E2)<0.06×10⁻² eV; B(M1)(W.u.)=3.6×10⁻², B(E2)(W.u.)<0.3 for J^π=3/2⁺; B(E1)(W.u.)=1.1×10⁻³, B(M2)(W.u.)<10 for J^π=3/2⁻ (1968Li07). δ: from 1968Li07. Others:+2.2 *2*

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$^{32}S(p,\gamma)$ 1976Al01 (continued)

$\gamma(^{33}Cl)$ (continued)

E_i(level)	J^π_i	E_γ‡	I_γ‡	E_f	J^π_f	Mult.‡	δ‡	Comments
								giving $\Gamma\gamma$(M1)=0.47×10^{-2} eV, $\Gamma\gamma$(E2)=2.28×10^{-2} eV; B(M1)(W.u.)=6.3×10^{-3}, B(E2)(W.u.)=11 for J^π=3/2$^+$; B(E1)(W.u.)=1.9×10^{-4}, B(M2)(W.u.)=380 for J^π=3/2$^-$ (1968Li07). δ: −0.14 *3* from 1975VaYG.
4112.34	3/2$^{(+)}$	4112.0 *2*	50 *5*	0	3/2$^+$			E_γ: from 2006Tr10. I_γ: from 1968Li07. δ: −11.4 *25* or 0.17 *3* for J=3/2 (1975VaYG).
4117.5	3/2$^-$	1271†	1.0 *5*	2846.33	3/2	D		Mult.: M1 in 1976Al01. B(M1)(W.u.)=0.11 *7* (1976Al01).
		3307†	70 *4*	810.64	1/2$^+$	E1		I_γ: weighted average from 1976Al01 and 1992Il01. B(E1)(W.u.)=8×10^{-4} *3* (1976Al01).
		4117†	29 *4*	0	3/2$^+$	E1		I_γ: weighted average from 1976Al01 and 1992Il01. B(E1)(W.u.)=2.9×10^{-4} *11* (1976Al01).
4438.99		1592†	1.2 *4*	2846.33	3/2			
		2087†	7 *1*	2351.81	3/2$^+$			
		3628†	4 *1*	810.64	1/2$^+$			
		4438.7† *2*	88 *2*	0	3/2$^+$			E_γ: from 2006Tr10.
4464.2		2477†	26 *3*	1986.4	5/2$^+$			
		3653†	27 *3*	810.64	1/2$^+$			
		4464.1† *4*	47 *4*	0	3/2$^+$			E_γ: from 2006Tr10.
4746.7		1771†	11 *2*	2975.4	7/2$^+$			
		1908†	1.0 *3*	2838.95	5/2$^+$			
		2061†	0.4 *2*	2685.5	7/2$^-$,(5/2$^-$)			
		2395†	1.6 *3*	2351.81	3/2$^+$			
		2760†	8 *2*	1986.4	5/2$^+$			
		3936†	0.6 *3*	810.64	1/2$^+$			
		4746†	78 *2*	0	3/2$^+$			
4775.4	7/2$^-$	1800†	≤3	2975.4	7/2$^+$			
		1929†	9 *2*	2846.33	3/2	Q		Mult.: E2 in 1976Al01. A_2=+0.14 *10*, A_4=−0.11 *11* (1976Al01). B(E2)(W.u.)=8 *2* (1976Al01).
		1936†	53 *5*	2838.95	5/2$^+$	E1+M2	−0.02 *2*	A_2=−0.39 *3*, A_4=+0.06 *5* (1976Al01). B(E1)(W.u.)=1.2×10^{-3} *3*, B(M2)(W.u.)<2.3 (1976Al01).
		2090†	38 *5*	2685.5	7/2$^-$,(5/2$^-$)	M1+E2	−0.32 *4*	A_2=+0.09 *3*,A_4=+0.06 *5* (1976Al01). δ: obtained when J^π(Ex=2685)=7/2$^-$, giving B(M1)(W.u.)=0.024 *6*, B(E2)(W.u.)=2.1 *7*; δ=+0.21 *4* if J^π(Ex=2685)=5/2$^-$, giving B(M1)(W.u.)=0.025 *6*,B(E2)(W.u.)=1.0 *4* (1976Al01).
		2789†	≤1	1986.4	5/2$^+$			
5548.6	1/2$^+$	4737.6 *4*	88 *3*	810.64	1/2$^+$	M1		E_γ,I_γ: from 2006Tr10. Mult.: from 1972Es02.

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^{32}S(p,γ) 1976Al01 (continued)

γ(^{33}Cl) (continued)

E_i(level)	E_γ ‡	I_γ ‡	E_f	J^π_f	Comments
					B(M1)(W.u.)=0.015 *4*\$Γ(M1)=0.34 eV *9* (1972Es02). Γγ=0.685 eV *70*(1974Ab06).
5548.6	5548 *2*	12 *3*	0	3/2$^+$	E_γ,I_γ: from 2006Tr10. Mult.: from 1972Es02. 1974Ab06 gives Eγ=5558 keV *3*,Iγ=7.7 *16*. B(M1)(W.u.)<0.014\$B(E2)(W.u.)<1.8\$Γ(M1)<0.05 eV (1972Es02). I_γ: from 1974Ab06. Γγ=0.058 eV *10*(1974Ab06).

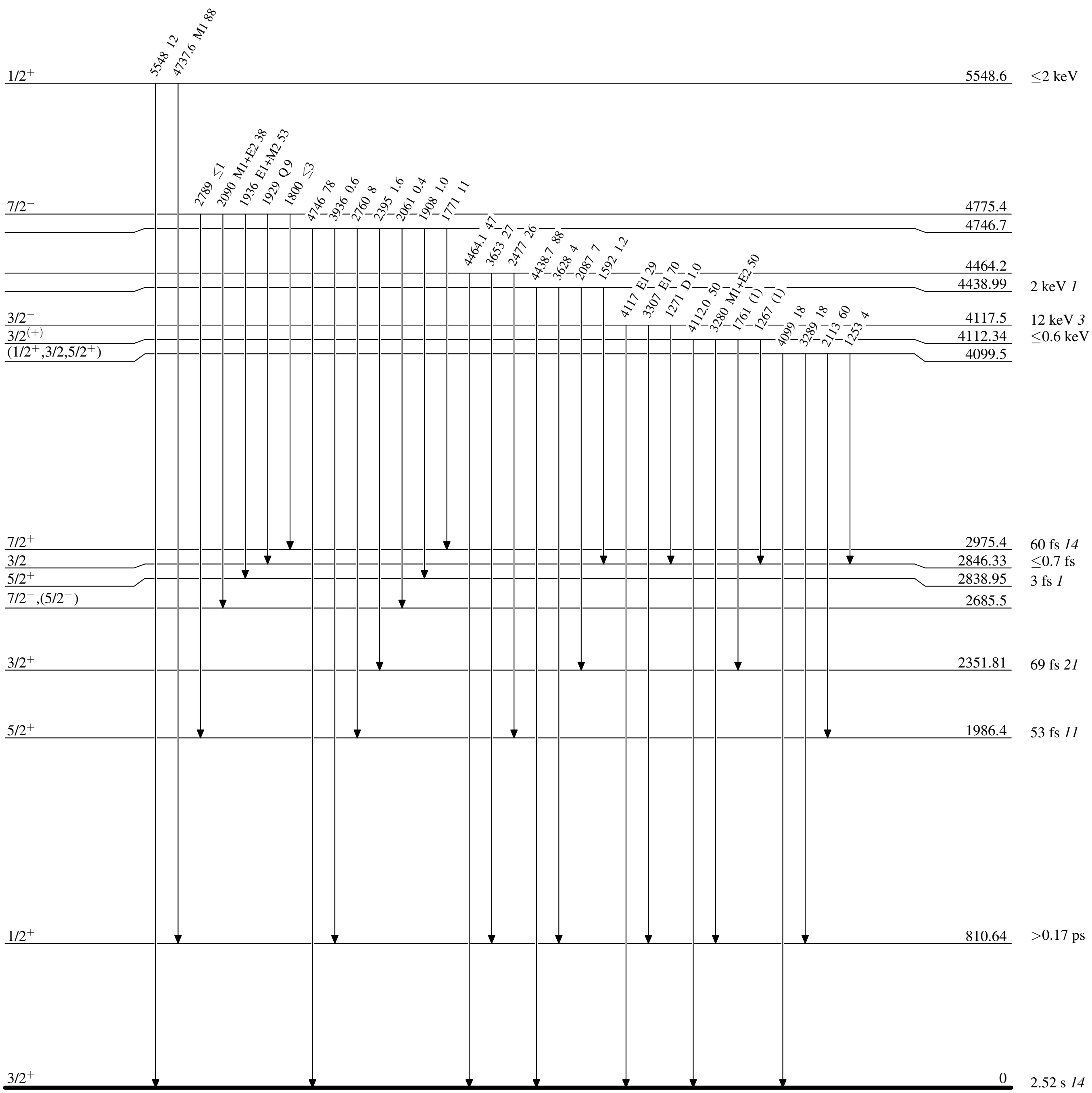
† From level-energy difference (1976Al01).

‡ From 1976Al01, unless indicated otherwise.

$^{32}S(p,\gamma)$ 1976Al01

Level Scheme

Intensities: % photon branching from each level

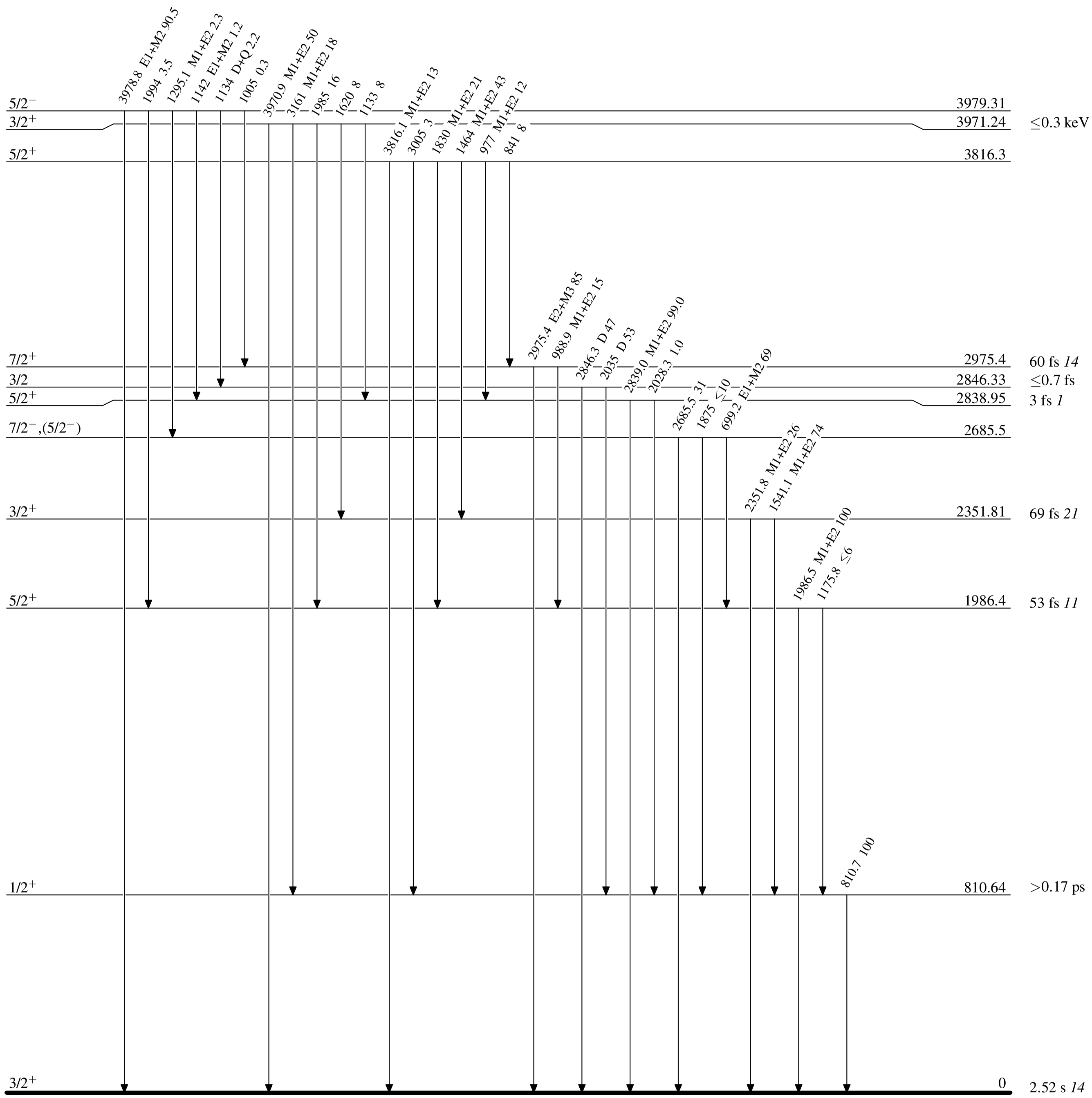


$^{33}_{17}Cl_{16}$

$^{32}S(p,\gamma)$ **1976Al01**

Level Scheme (continued)

Intensities: % photon branching from each level



$^{33}_{17}Cl_{16}$