^{36}S(α,nγ) 1978St16

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 149, 1 (2018)	1-Jan-2018

1978St16: E=6.0, 6.6 and 7.8 MeV alpha beams were produced from the 6-MV tandem Van de Graaff accelerator at Fysisch Laboratorium. Target was 50 μg/cm^2 Ag_2S (81.1% in ^{36}S) on a 200 μg/cm^2 Ag backing. Neutrons were detected with a neutron detector in the Utrecht neutron TOF system; γ rays were detected with two Ge(Li) counters. Measured Eγ, Iγ, $\gamma\gamma$-coin, n$\gamma(\theta)$, Doppler-shift attenuation (DSA). Deduced levels, J, π, $T_{1/2}$, γ-ray multipolarities, branching and mixing ratios. Comparisons with available data and theoretical calculations. Data are also available from the measurement of (d,pγ). See the (d,pγ) dataset for details.

^{39}Ar Levels

E(level)[†]	J$^\pi$[#]	$T_{1/2}$[&]	Comments
0.0	7/2$^-$[@]		
1267.21[‡]	3/2		
1517.54[‡]	3/2		
2092.42 *12*	5/2	<35 fs	
2342.2 *2*	(5/2$^-$,7/2,9/2$^-$)	118 fs *35*	
2359.0 *5*	1/2$^+$[@]	>0.42 ps	
2433.3 *2*	3/2$^-$	0.69 ps *28*	
2481.49 *13*	7/2$^-$	0.35 ps *15*	
2503.24 *15*	(3/2,5/2)$^+$	1.0 ps *4*	J$^\pi$: negative parity would lead to unacceptably large M2 strength for 985.79γ.
2523.74 *17*	(5/2$^-$,7/2,9/2$^-$)	0.23 ps *9*	
2631.56 *15*	3/2$^-$[@]	0.7 ps *+10−4*	
2651.1[‡]	11/2$^-$[@]		
2755.5 *3*	5/2$^-$	0.12 ps *5*	
2829.9 *2*	1/2$^+$[@]	>0.69 ps	
2950.0 *2*	(3/2$^+$,5/2)	0.30 ps *+28−14*	
3061.9 *2*	5/2$^-$,7/2$^-$[@]	0.10 ps *4*	
3159.9 *3*	5/2$^-$,7/2$^-$[@]	1.4 ps *+14−6*	
3265.6 *3*	3/2$^-$	<48 fs	E(level): weakly populated in (α,nγ), strongly populated in (d,pγ) (1978St16).
3287.0 *4*	1/2$^+$[@]	0.25 ps *+28−12*	
3360.7 *3*	5/2$^+$[@]	0.08 ps *6*	
3562.6 *4*	3/2$^-$[@]	<45 fs	

[†] From 1978St16, combined with data from (d,pγ) in 1978St16.
[‡] Rounded-off values from Adopted Levels.
[#] From γ-ray multipolarities deduced based on $\gamma(\theta)$ and considerations of transition strengths and RUL, unless otherwise noted.
[@] From Adopted Levels.
[&] From DSAM (1978St16).

γ(^{39}Ar)

E$_i$(level)	J$_i^\pi$	E$_\gamma$[†]	I$_\gamma$[‡]	E$_f$	J$_f^\pi$	Mult.[#]	δ[#]	Comments
1267.21	3/2	1267.19	100	0.0	7/2$^-$	Q(+O)	+0.06 *4*	A$_2$=+0.07 *3*
1517.54	3/2	250.33	54.1 *12*	1267.21	3/2	D(+Q)	−0.01 *9*	A$_2$=+0.37 *8*
		1517.51	45.9 *12*	0.0	7/2$^-$	Q(+O)	+1.0 *+10−9*	A$_2$=+0.22 *6*
								δ: from −0.1<δ<+2.0 (1978St16).
2092.42	5/2	574.9[@]	<0.7	1517.54	3/2			

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^{36}S(α,nγ) 1978St16 (continued)

γ(^{39}Ar) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π	Mult.[#]	δ[#]	Comments
2092.42	5/2	825.2	3.9 *8*	1267.21	3/2			
		2092.36	96.1 *8*	0.0	7/2$^-$	D+Q	−0.21 *6*	A_2=+0.14 *6*
2342.2	(5/2$^-$,7/2,9/2$^-$)	249.8[@]	<3	2092.42	5/2			
		2342.1	100	0.0	7/2$^-$			A_2=+0.52 *8*
2359.0	1/2$^+$	266.6[@]	<0.6	2092.42	5/2			
		841.4	5 *2*	1517.54	3/2			
		1091.8	95 *2*	1267.21	3/2			
		2358.9[@]	<3	0.0	7/2$^-$			
2433.3	3/2$^-$	340.9[@]	<10	2092.42	5/2			
		915.7	5.3 *15*	1517.54	3/2			
		1166.1	70.9 *9*	1267.21	3/2	M1+E2	+0.41 *11*	A_2=+0.87 *9* δ: or +1.3 *3*.
		2433.2	23.8 *9*	0.0	7/2$^-$	Q(+O)	−0.01 *17*	A_2=+0.13 *14*
2481.49	7/2$^-$	389.07	17.5 *6*	2092.42	5/2	D(+Q)	+0.03 *12*	A_2=−0.3 *2*
		963.9[@]	<3	1517.54	3/2			
		1214.3[@]	<3	1267.21	3/2			
		2481.4	82.5 *6*	0.0	7/2$^-$	M1+E2	−7 *+3−16*	A_2=−0.41 *8*; A_4=−0.59 *13*
2503.24	(3/2,5/2)$^+$	410.9[@]	<10	2092.42	5/2			
		985.79	91 *3*	1517.54	3/2			A_2=+0.18 *7*
		1236.1	9 *3*	1267.21	3/2			
2523.74	(5/2$^-$,7/2,9/2$^-$)	1006.2[@]	<5	1517.54	3/2			
		2523.65	100	0.0	7/2$^-$			A_2=+0.26 *7*; A_4=−0.21 *10*
2631.56	3/2$^-$	198.3[@]	<2	2433.3	3/2$^-$			
		272.6[@]	<2	2359.0	1/2$^+$			
		289.4[@]	<1.0	2342.2	(5/2$^-$,7/2,9/2$^-$)			
		539.14	81 *2*	2092.42	5/2	D(+Q)	+0.07 *14*	A_2=−0.19 *11*
		1114.00	13.4 *17*	1517.54	3/2			
		1364.3	5.7 *8*	1267.21	3/2			
		2631.5[@]	<0.7	0.0	7/2$^-$			
2651.1	11/2$^-$	292.1[@]	<0.4	2359.0	1/2$^+$			
		308.9[@]	<8	2342.2	(5/2$^-$,7/2,9/2$^-$)			
		558.7[@]	<8	2092.42	5/2			
		1383.9[@]	<0.7	1267.21	3/2			
		2651.0	100	0.0	7/2$^-$			A_2=+0.44 *12*; A_4=−0.30 *18*
2755.5	5/2$^-$	231.8[@]	<0.5	2523.74	(5/2$^-$,7/2,9/2$^-$)			
		274.0[@]	<6	2481.49	7/2$^-$			
		322.2[@]	<6	2433.3	3/2$^-$			
		663.1[@]	<8	2092.42	5/2			
		1237.9[@]	<4	1517.54	3/2			
		1488.3	43.7 *14*	1267.21	3/2	D(+Q)	−0.01 *5*	A_2=−0.59 *14*; A_4=−0.49 *24*
		2755.4	56.3 *14*	0.0	7/2$^-$	M1+E2	+0.37 *10*	A_2=−0.65 *9*
2829.9	1/2$^+$	306.2[@]	<10	2523.74	(5/2$^-$,7/2,9/2$^-$)			
		326.6[@]	<1.1	2503.24	(3/2,5/2)$^+$			
		348.4[@]	<0.8	2481.49	7/2$^-$			
		396.6[@]	<7	2433.3	3/2$^-$			
		470.9[@]	<7	2359.0	1/2$^+$			
		487.7[@]	<7	2342.2	(5/2$^-$,7/2,9/2$^-$)			
		737.5[@]	<4	2092.42	5/2			
		1312.3	46.3 *13*	1517.54	3/2			A_2=+0.24 *18*

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^{36}S(α,nγ) 1978St16 (continued)

$\gamma(^{39}Ar)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π	Mult.[#]	δ[#]	Comments
2829.9	1/2$^+$	1562.7	53.7 *13*	1267.21	3/2			A_2=+0.07 *18*
		2829.8[@]	<1.3	0.0	7/2$^-$			
2950.0	(3/2$^+$,5/2)	300.1[@]	<10	2651.1	11/2$^-$			
		318.5[@]	<7	2631.56	3/2$^-$			
		426.4[@]	<5	2523.74	(5/2$^-$,7/2,9/2$^-$)			
		446.8	51.4 *10*	2503.24	(3/2,5/2)$^+$			A_2=+0.3 *2*
		468.6[@]	<4	2481.49	7/2$^-$			
		591.1[@]	<5	2359.0	1/2$^+$			
		607.9[@]	<3	2342.2	(5/2$^-$,7/2,9/2$^-$)			
		857.7[@]	<4	2092.42	5/2			
		1432.5	48.6 *10*	1517.54	3/2			A_2=−0.01 *16*
		1682.9[@]	<5	1267.21	3/2			
		2950.0[@]	<2	0.0	7/2$^-$			
3061.9	5/2$^-$,7/2$^-$	306.4[@]	<10	2755.5	5/2$^-$			
		430.3[@]	<8	2631.56	3/2$^-$			
		558.6[@]	<6	2503.24	(3/2,5/2)$^+$			
		580.4[@]	<6	2481.49	7/2$^-$			
		628.6[@]	<8	2433.3	3/2$^-$			
		702.9[@]	<6	2359.0	1/2$^+$			
		969.5	23.5 *13*	2092.42	5/2			A_2=−0.5 *3*
		1794.6[@]	<6	1267.21	3/2			
		3061.8	76.5 *13*	0.0	7/2$^-$			A_2=+0.18 *12*
3159.9	5/2$^-$,7/2$^-$	404.4[@]	<8	2755.5	5/2$^-$			
		528.3[@]	<6	2631.56	3/2$^-$			
		636.2	23.7 *12*	2523.74	(5/2$^-$,7/2,9/2$^-$)			
		656.6[@]	<6	2503.24	(3/2,5/2)$^+$			
		678.4	17.1 *10*	2481.49	7/2$^-$			
		726.6[@]	<6	2433.3	3/2$^-$			
		800.9[@]	<8	2359.0	1/2$^+$			
		1067.5[@]	<8	2092.42	5/2			
		1642.3[@]	<6	1517.54	3/2			
		1892.6[@]	<6	1267.21	3/2			
		3159.8	59.2 *14*	0.0	7/2$^-$			A_2=−0.23 *16*
3265.6	3/2$^-$	315.5[@]	<1.2	2950.0	(3/2$^+$,5/2)			
		435.7[@]	<1.0	2829.9	1/2$^+$			
		615.6[@]	<0.3	2651.1	11/2$^-$			
		634.0	1.5 *2*	2631.56	3/2$^-$			
		741.9[@]	<0.3	2523.74	(5/2$^-$,7/2,9/2$^-$)			
		762.3[@]	<0.4	2503.24	(3/2,5/2)$^+$			
		784.1[@]	<0.3	2481.49	7/2$^-$			
		832.3	0.7 *2*	2433.3	3/2$^-$			
		906.6[@]	<0.4	2359.0	1/2$^+$			
		923.4[@]	<0.4	2342.2	(5/2$^-$,7/2,9/2$^-$)			
		1173.2[@]	<0.4	2092.42	5/2			
		1748.0[@]	<1.8	1517.54	3/2			
		1998.3	97.8 *4*	1267.21	3/2	M1+E2	−16 *6*	Mult.,δ: based on p$\gamma(\theta)$ in (d,pγ) of 1978St16.

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^{36}S(α,nγ) 1978St16 (continued)

$\gamma(^{39}Ar)$ (continued)

E_i(level)	J_i^π	E_γ †	I_γ ‡	E_f	J_f^π
3265.6	$3/2^-$	3265.5@	<0.4	0.0	$7/2^-$
3287.0	$1/2^+$	2019.7	100	1267.21	3/2
3360.7	$5/2^+$	1843.1	100	1517.54	3/2
3562.6	$3/2^-$	3562.4	100	0.0	$7/2^-$

† From level-energy differences. Those γ rays with questionable placements have not been seen by 1978St16; only upper limits of intensities are given. Such γ rays have not been included in Adopted Gammas, unless confirmed in another reaction.
‡ From data combined from (α,nγ) and (d,pγ) in 1978St16.
# Deduced based on particle-$\gamma(\theta)$ in 1978St16 and RUL, combined with data from (d,pγ) in 1978St16.
@ Placement of transition in the level scheme is uncertain.

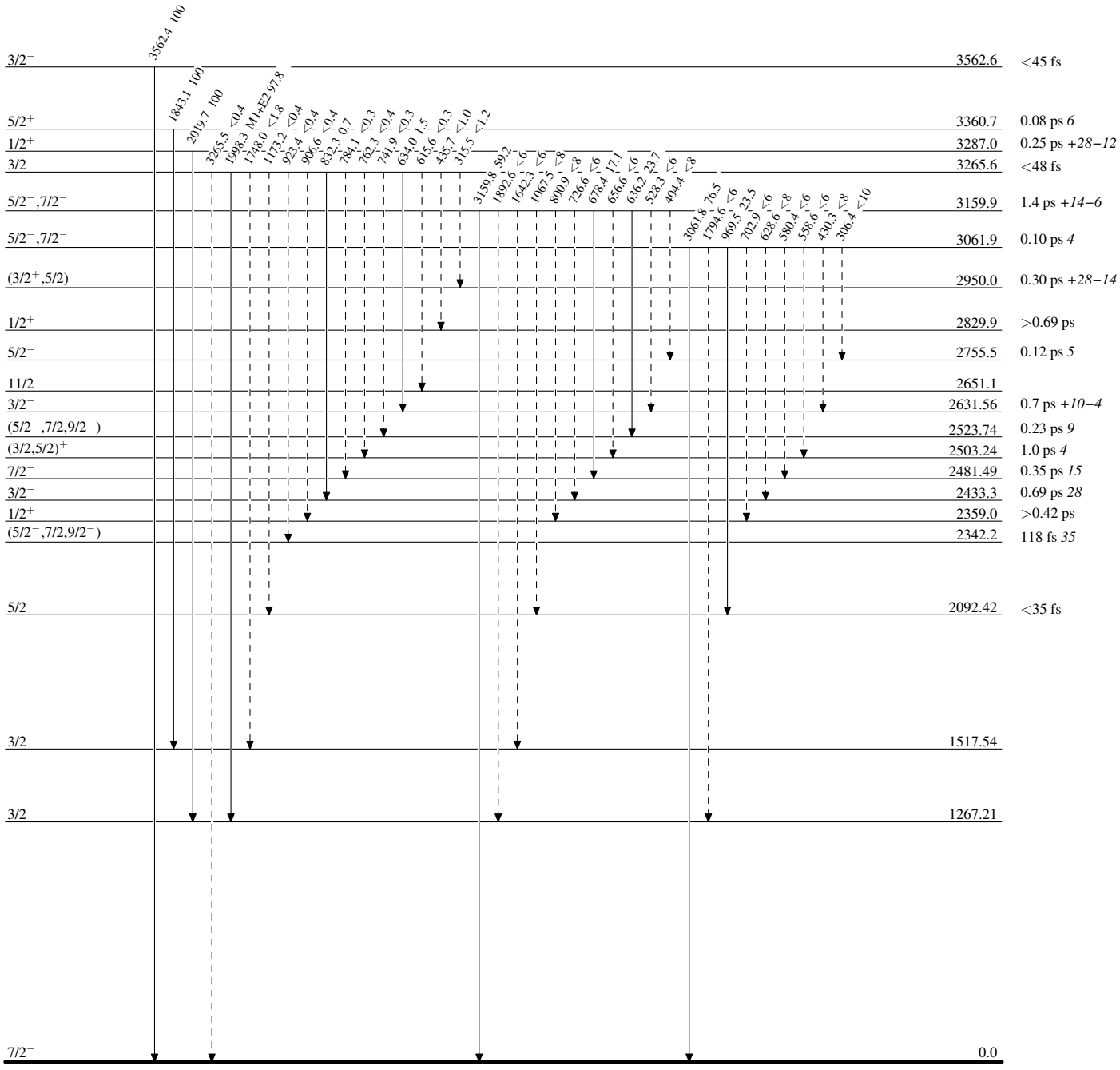
^{36}S(α,nγ) **1978St16**

Legend

Level Scheme

Intensities: % photon branching from each level

γ Decay (Uncertain)



$^{39}_{18}Ar_{21}$

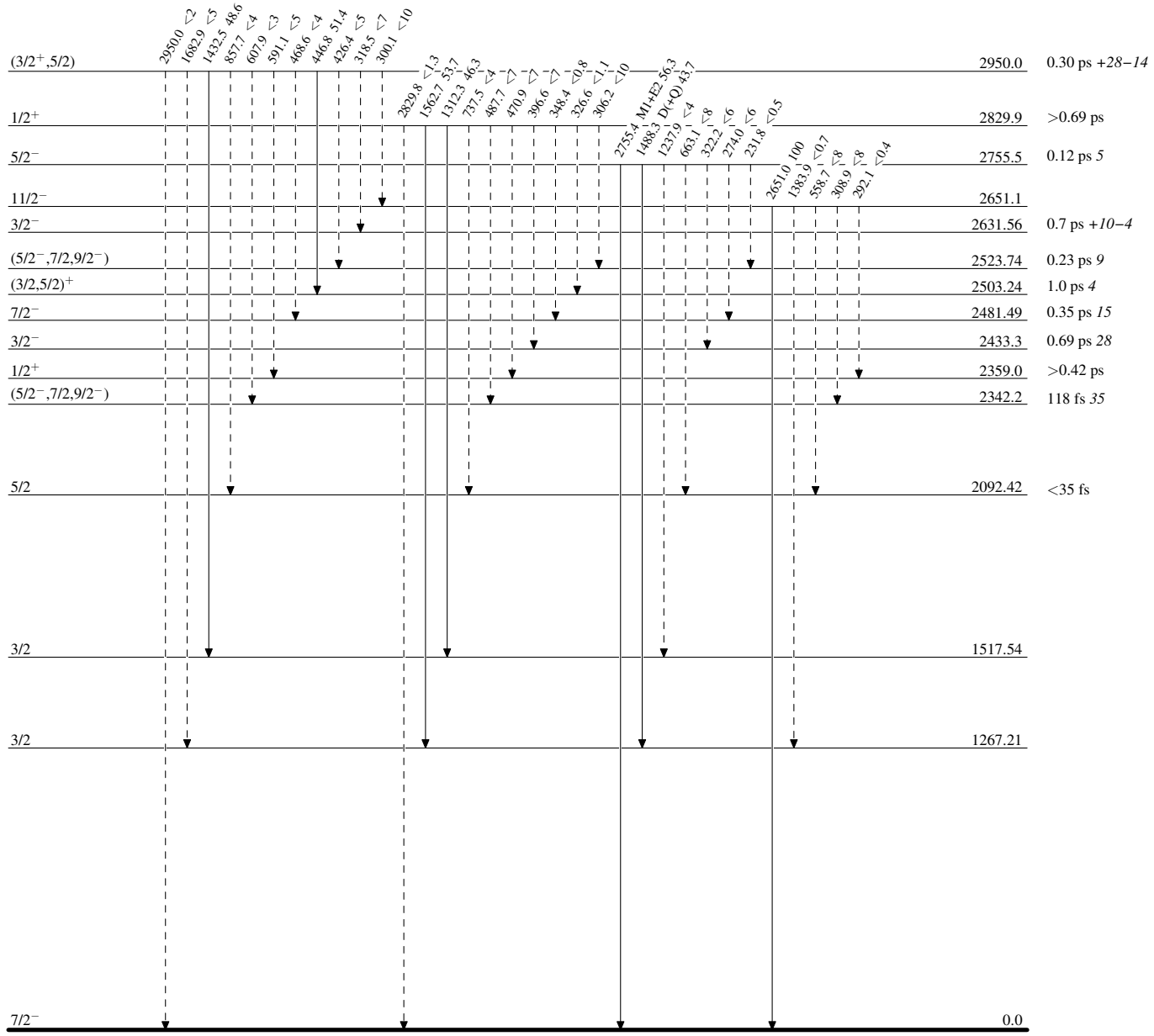
^{36}S(α,nγ) 1978St16

Legend

Level Scheme (continued)

Intensities: % photon branching from each level

γ Decay (Uncertain)



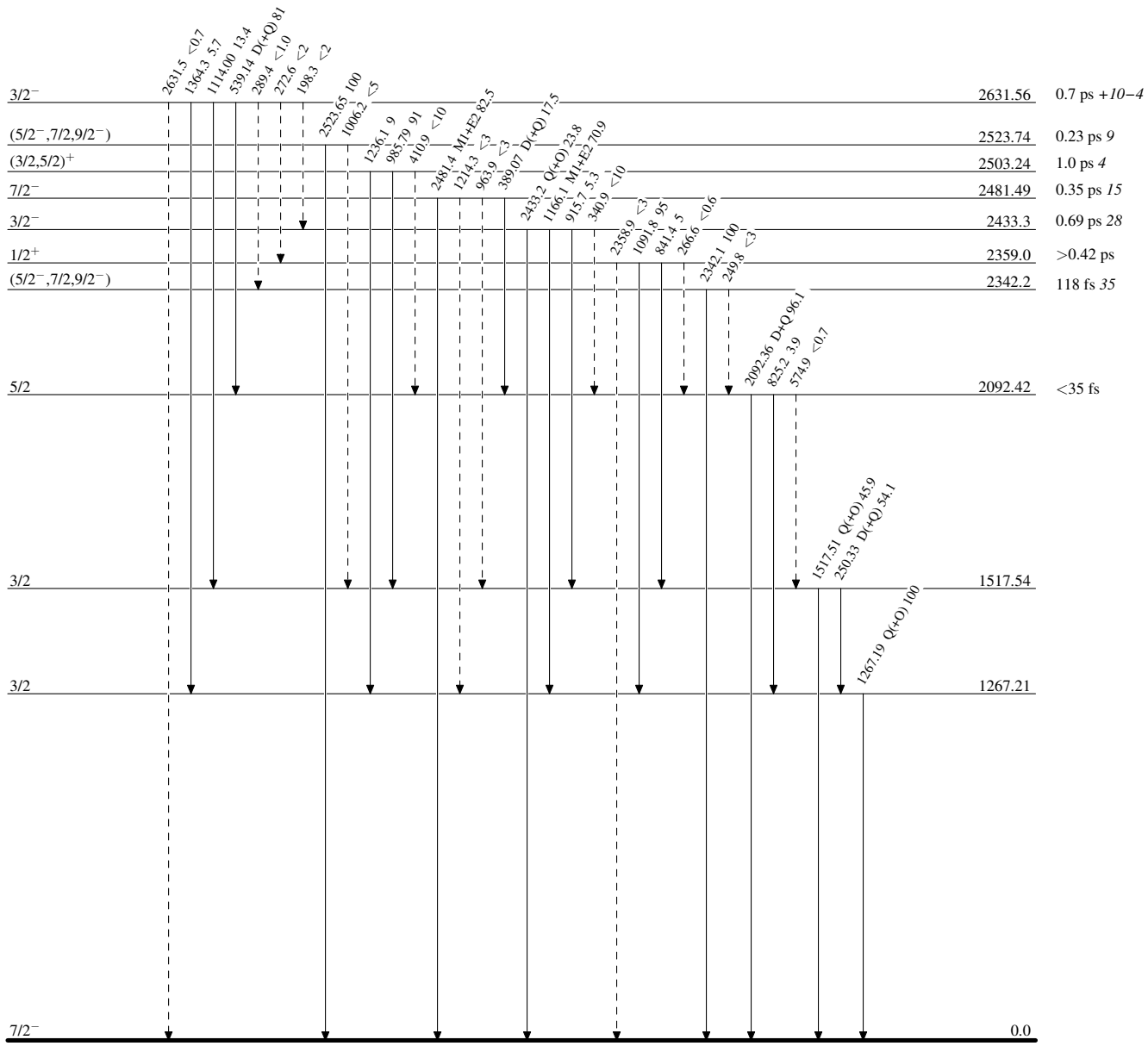
$^{39}_{18}Ar_{21}$

^{36}S(α,nγ) 1978St16 Legend

Level Scheme (continued)

Intensities: % photon branching from each level

– – – – – – ► γ Decay (Uncertain)



$^{39}_{18}Ar_{21}$