^{29}Si(α,pγ) 1976Va09,1973Va14,1973Ca18

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

1976Va09: E=10.40, 10.69, 11.00, 12.80, 12.93 and 16.30 MeV α beams were produced from the Utrecht 6 MV Tandem Van de Graaff accelerator. Target was 100 μg/cm^2 self-supporting SiO_2 (enriched 92% ^{29}Si). Protons were detected with Si surface barrier detectors and γ rays were detected with Ge and NaI(Tl). Measured Eγ, Iγ, pγ-coin, p$\gamma(\theta)$. Deduced levels, J, π, $T_{1/2}$, γ-ray multipolarities, mixing ratios, branching ratios. Compared with available data and theoretical calculations. Also from the same group but at differing E(α): E=10.65-11 MeV (1973Va14), E=7-11 MeV (1970Va12). A 20% systematic is assumed from the stopping power (slowing-down theory).

1973Ca18: E=8.0-9.5 MeV α beams were produced at Oliver Lodge Laboratory, Liverpool. Target was SiO_2 (enriched 95% ^{29}Si).γ rays were detected with Ge and NaI(Tl) detectors. Measured Eγ, Iγ, Doppler-shift attenuation. Deduced levels, $T_{1/2}$, γ-ray branching ratios. A 25% systematic uncertainty is assumed from the slowing-down theory.

1971Go10: E=4.52 MeV α beam was produced from the tandem accelerator at the Naval Research California Institute of Technology. Target was 29 μg/cm^2 95% enriched $^{29}SiO_2$ on 150 μg/cm^2 copper backing. γ rays were detected with a Ge detector. Measured Eγ, Iγ, recoil distance. Deduced lifetime for 78-keV level.

1971St33: E=10.3 MeV α beam from the 5.5 MV Van de Graaff accelerator of Universite Laval. Protons were detected with an annular solid-state diode and γ rays were detected with a NaI(Tl) detector and a Ge(Li) detector. Measured Eγ, Iγ, p$\gamma(\theta)$. Deuced levels, J, γ-ray mixing ratios.

1970Mo09: E=7.65 α beam from the 4 MV Van de Graaff accelerator of the Triangle Universities Nuclear Laboratory. Protons were detected with an annular surface barrier Si detector and γ rays were detected with a NaI(Tl) detector. Measured Eγ, Iγ, p$\gamma(\theta)$. Deduced levels, J, γ-ray mixing ratios.

^{32}P Levels

E(level)[†]	J$^\pi$[‡]	$T_{1/2}$[#]	Comments
0	1$^+$[&]		
78.2 *1*	2$^+$[&]	278 ps *9*	$T_{1/2}$: from recoil-distance method (1971Go10). Additional information 1.
512.9 *2*	0$^+$[&]	2.08 ps *59*	J$^\pi$: (0,1,2) from p$\gamma(\theta)$ in 1970Mo09. $T_{1/2}$: from 1970Va12. Other: >1.4 fs (1973Va14). Additional information 2.
1149.8 *2*	1$^+$[&]	162 fs *42*	E(level): other: 1149.8 *5* (1973Ca18). J$^\pi$: (0,1,2,3) from p$\gamma(\theta)$ in 1970Mo09. $T_{1/2}$: weighted average from 146 fs *48* (1973Ca18), 152 fs *42* (1973Va14), and 187 fs *45* (1970Va12). Additional information 3.
1323.2 *2*	2$^+$	267 fs *49*	E(level): other: 1323.1 *4* (1973Ca18). J$^\pi$: spin=1 or 2 from p-1323$\gamma(\theta)$ (1973Va14); spin=2 from p-431$\gamma(\theta)$ from 1754 level (1973Va14); 1323γ M1+E2 to 1$^+$. $T_{1/2}$: weighted average of 243 fs *49* (1973Va14), 402 fs *108* (1973Ca18), and 263 fs *56*. Additional information 4.
1754.4 *2*	3$^+$	341 fs *49*	E(level): other: 1754.6 *5* (1973Ca18). J$^\pi$: spin=3 from p-1677$\gamma(\theta)$ (1970Mo09,1973Va14); 431γ M1+E2 to 2$^+$. $T_{1/2}$: weighted average of 427 fs *114* (1973Ca18), 319 fs *49* (1973Va14), 354 fs *76* (1970Va12). Additional information 5.
2177.6 *2*	3$^+$	41 fs *9*	E(level): others: 2178.2 *5* (1973Ca18), 2175.3 *10* (1970Va12). J$^\pi$: spin=1,2,3 from p-2100$\gamma(\theta)$ and spin=3 from p-972$\gamma(\theta)$ from 3149 level (1973Va14); 2100γ M1+E2 to 2$^+$. $T_{1/2}$: weighted average of 63 fs *19* (1973Ca18), 36 fs *9* (1973Va14), and 42 fs *18* (1970Va12). Additional information 6.
2218.9 *2*	2$^+$	141 fs *35*	E(level): others: 2219.0 *7* (1973Ca18), 2216.5 *10* (1970Va12).

Continued on next page (footnotes at end of table)

^{29}Si(α,pγ) 1976Va09,1973Va14,1973Ca18 (continued)

^{32}P Levels (continued)

E(level)[†]	J$^\pi$[‡]	T$_{1/2}$[#]	Comments
			J$^\pi$: spin=2,(1) from p-2219$\gamma(\theta)$ (1973Va14); spin=1 excluded by 1931γ from 4149,3$^-$ level; 2219γ M1+E2 to 1$^+$. T$_{1/2}$: weighted average of 199 fs *53* (1973Ca18), 111 fs *35* (1973Va14), and 146 fs *35* (1970Va12). Additional information 7.
2230	1$^+$[&]	25 fs *14*	E(level): from 1973Ca18, 1973Va14, 1970Va12. J$^\pi$: 1$^+$ also quoted in 1973Va14, but no p$\gamma(\theta)$ data for this assignment. T$_{1/2}$: from 1970Va12. Other: <35 fs (1973Va14). Additional information 8.
2658.0[@] *10*	2	<7 fs	E(level): other: 2657 *2* (1973Va14). J$^\pi$: spin=1,2 from p-2658$\gamma(\theta)$ (1973Va14) and spin=1 excluded by 1490γ from 4149,3$^-$ level; T$_{1/2}$: from 1973Va14. Other: <28 fs (1973Ca18). Additional information 9.
2740 *2*	1	49 fs *28*	E(level): from 1973Va14. Other: 2746.0 *7* (1973Ca18) is discrepant, which is probably based on a contaminated 1596γ. J$^\pi$: from p-2230$\gamma(\theta)$ (1973Va14), but p$\gamma(\theta)$ data not listed by the authors. Other: spin=1,2 from p-2230$\gamma(\theta)$ in 1971St33. T$_{1/2}$: from 1973Va14, probably using the strongest 2230γ. Other: 4.9 ps *+24−18* from 1973Ca18 using a 1596γ is discrepant. This 1596γ in 1973Ca18 could be contaminated by a similar transition in ^{29}Si as indicated by authors and this transition is reported as a weak transition in 1973Va14 and is not seen in 1971St33 which report only 2230γ from this level. So the evaluator considers this T$_{1/2}$ from 1973Ca18 questionable. Additional information 10.
3004.9 *6*	3$^+$	37 fs *14*	E(level): weighted average of 3005.4 *5* (1973Ca18) and 3004.3 *5* (1973Va14). J$^\pi$: spin=3,(2) from p-2927$\gamma(\theta)$ and p-828$\gamma(\theta)$, spin=2 ruled out by p-1682$\gamma(\theta)$ (1973Va14,1976Va09); 1682γ M1+E2 to 2$^+$. T$_{1/2}$: weighted average of 60 fs *15* (1973Ca18) and 28 fs *9* (1973Va14). Additional information 11.
3149.3 *3*	4$^+$	367 fs *56*	E(level): others: 3149.7 *5* (1973Ca18), 3149.0 *10* (1973Va14). J$^\pi$: spin=4 from p-1827$\gamma(\theta)$ (1973Va14); 972γ M1+E2 to 3$^+$. T$_{1/2}$: weighted average of 354 fs *92* (1973Ca18) and 367 fs *56* (1973Va14). Additional information 12.
3263.8 *6*	2	90 fs *21*	E(level),T$_{1/2}$: from 1973Va14. J$^\pi$: spin=2 from p-2112$\gamma(\theta)$ (1973Va14,1976Va09). Additional information 13.
3322.1 *8*	3$^-$[&]	164 fs *39*	E(level): weighted average of 3322.6 *8* (1973Ca18) and 3321.5 *9* (1973Va14). J$^\pi$: spin=4 ruled out by p-3245$\gamma(\theta)$ (1973Va14). T$_{1/2}$: weighted average of 250 fs *62* (1973Ca18) and 146 fs *28* (1973Va14). Additional information 14.
3443.0 *6*	4$^-$[&]	263 fs *56*	E(level),T$_{1/2}$: from 1973Va14. Additional information 15.
3445.0 *5*	(0,1,2)	24 fs *12*	E(level): weighted average of 3445.2 *4* (1973Ca18) and 3444.0 *9* (1973Va14). J$^\pi$: from p-3444$\gamma(\theta)$ in 1973Va14. T$_{1/2}$: from 1973Ca18. Additional information 16.
3797.3 *4*	3	49 fs *29*	E(level): other: 3795.9 6 (1973Ca18). J$^\pi$: spin=3 from p-2477$\gamma(\theta)$ (1976Va09). T$_{1/2}$: from 1973Ca18, other: <66 fs (1976Va09). Additional information 17.
3881.0[@] *5*		19 fs *16*	E(level): other: 3875 *2* from 1976Va09. T$_{1/2}$: from 1973Ca18. Additional information 18.
3988.7 *5*		12 fs *6*	E(level): other: 3992.5 *10* (1973Ca18) is discrepant.

Continued on next page (footnotes at end of table)

^{29}Si(α,pγ) 1976Va09,1973Va14,1973Ca18 (continued)

^{32}P Levels (continued)

E(level)[†]	J$^\pi$[‡]	T$_{1/2}$[#]	Comments
			T$_{1/2}$: other: <7 fs (1973Ca18). Additional information 19.
4007[@]			
4034.6 *4*	4$^+$,(2$^+$)	24 fs *17*	J$^\pi$,T$_{1/2}$: from 1976Va09. Additional information 20.
4036[@]			
4148.8 *4*	3$^-$	39 fs *17*	E(level): other: 4150.6 *6* (1973Ca18). J$^\pi$: spin=3 from p-4070$\gamma(\theta)$ (1976Va09); π=− from Adopted Levels. T$_{1/2}$: weighted average of 36 fs *17* (1973Ca18) and 49 fs *35* (1976Va09). Additional information 21.
4203 *3*			
4275.2 *4*	5$^-$	0.53 ps *8*	J$^\pi$: spin=5 from p-830$\gamma(\theta)$ an p-1126$\gamma(\theta)$; 830γ M1+E2 to 4$^-$. Additional information 22.
4312.5 *7*		55 fs *28*	Additional information 23.
4554.4 *8*			
4697.0 *7*			
4743.3 *4*	5$^+$,(3$^+$)	97 fs *28*	J$^\pi$: spin=5,(3) from p$\gamma(\theta)$ in 1976Va09; 1594γ M1+E2 to 4$^+$. Additional information 24.
4849.9 *7*			
5081.5 *15*		104 fs *35*	Additional information 25.
5252.9 *12*		<59 fs	Additional information 26.

[†] From 1976Va09 based on Eγ data, unless otherwise noted. Weighted averages are taken where multiple values are available. No Eγ values with uncertainties are explicitly listed in 1976Va09, 1973Va14, 1973Ca18, 1970Va12.

[‡] From 1973Va14 and 1976Va09 based on measured p$\gamma(\theta)$, γ-ray magnetic/electric nature deduced based on p$\gamma(\theta)$ and RUL, and known J^π of lowing-lying levels, unless otherwise noted.

[#] From average of values from 1970Va12, 1973Va14 and 1973Ca18 up to 3445 level and from 1976Va09 above that, unless otherwise noted. All values are measured using DSAM, unless otherwise noted. Note that results from 1973Va14 without a carbon backing lead to different half-lives however not all experiments explicitly say what backing they are using. For values from 1973Ca18, a 25% additional uncertainty due to slowing-down theory as assumed by the authors has been added in quadrature into the original uncertainties.

[@] From 1973Ca18.

[&] From Adopted Levels.

γ(^{32}P)

E$_i$(level)	J$_i^\pi$	E$_\gamma$[†]	I$_\gamma$[‡]	E$_f$	J$_f^\pi$	Mult.[#]	δ[#]	Comments
78.2	2$^+$	78.2 *1*	100	0	1$^+$			E$_\gamma$: from 1971Go10.
512.9	0$^+$	434.7[&]	<2	78.2	2$^+$			
		512.9	100	0	1$^+$			
1149.8	1$^+$	636.9	49.7 *17*	512.9	0$^+$			I$_\gamma$: others: 52 *3* (1973Ca18), 52 *3* (1970Va12).
		1071.6	42.8 *13*	78.2	2$^+$			I$_\gamma$: others: 40 *3* (1973Ca18), 40 *3* (1970Va12).
		1149.8	7.5 *7*	0	1$^+$			I$_\gamma$: others: 8 *3* (1973Ca18), 8 *1* (1970Va12).
1323.2	2$^+$	173.4[&]	<1	1149.8	1$^+$			
		810.3[&]	<2	512.9	0$^+$			
		1245.0	40.6 *10*	78.2	2$^+$	M1+E2		I$_\gamma$: others: 40 *2* (1973Ca18), 38 *3* (1970Va12). δ: +0.27 *7* or −8 +3−11 (1973Va14).
		1323.2	59.4 *10*	0	1$^+$	M1+E2		I$_\gamma$: others: 60 *2* (1973Ca18), 62 *3* (1970Va12). δ: +0.4 *2* or +1.42 *13* (1973Va14).
1754.4	3$^+$	431.2	2.0 *2*	1323.2	2$^+$	M1+E2[@]	+0.12[@] *10*	I$_\gamma$: others: 2.5 *3* (1973Ca18), 2.5 *3* (1970Va12).

Continued on next page (footnotes at end of table)

^{29}Si(α,pγ) 1976Va09,1973Va14,1973Ca18 (continued)

$\gamma(^{32}P)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π	Mult.[#]	δ[#]	Comments
1754.4	3$^+$	604.6[&]	<1	1149.8	1$^+$			
		1241.5[&]	<2	512.9	0$^+$			
		1676.2	95.9 *5*	78.2	2$^+$	M1+E2[@]	+0.73[@] *5*	I_γ: others: 94 *1* (1973Ca18), 94 *1* (1970Va12). δ: others: 0.45 *6* (1970Mo09), −0.84 *2* (1971St33).
		1754.4	2.1 *5*	0	1$^+$	Q(+O)	0.0 *3*	Additional information 27.
2177.6	3$^+$	423.2[&]	<1	1754.4	3$^+$			
		854.4[&]	<3	1323.2	2$^+$			
		1027.8[&]	<3	1149.8	1$^+$			
		1664.7[&]	<1	512.9	0$^+$			
		2099.3	91.0 *9*	78.2	2$^+$	M1+E2[@]	−0.14[@] *3*	I_γ: others: 87 *3* (1973Ca18), 90 *2* (1970Va12).
		2177.5	9.0 *9*	0	1$^+$	E2(+M3)[@]	+0.09[@] *11*	I_γ: others: 13 *3* (1973Ca18), 10 *2* (1970Va12).
2218.9	2$^+$	464.5[&]	<1	1754.4	3$^+$			
		895.7	31.5 *15*	1323.2	2$^+$	D(+Q)[@]	0.0[@] *3*	I_γ: others: 5 *2* (1973Ca18), 30 *2* (1970Va12).
		1069.1	9 *2*	1149.8	1$^+$			I_γ: others: 5 *2* (1973Ca18), 5 *1* (1970Va12).
		1706.0[&]	<3	512.9	0$^+$			
		2140.6	12 *2*	78.2	2$^+$			I_γ: others: 17 *2* (1973Ca18), 17 *1* (1970Va12).
		2218.8	47 *2*	0	1$^+$	M1+E2[@]	−0.5[@] *2*	I_γ: others: 48 *2* (1973Ca18), 48 *2* (1970Va12).
2230	1$^+$	476[&]	<4	1754.4	3$^+$			
		907[&]	<1	1323.2	2$^+$			
		1080[&]	<5	1149.8	1$^+$			
		1717[&]	<1	512.9	0$^+$			
		2152	81 *3*	78.2	2$^+$			I_γ: others: 95 *3* (1973Ca18), 95 *3* (1970Va12).
		2230	19 *3*	0	1$^+$			I_γ: others: 5 *3* (1973Ca18), 5 *3* (1970Va12).
2658.0	2	480.4[&]	<2	2177.6	3$^+$			
		903.6[&]	<1	1754.4	3$^+$			
		1334.8[&]	<2	1323.2	2$^+$			
		1508.2[&]	<1	1149.8	1$^+$			
		2145.0[&]	<10	512.9	0$^+$			
		2579.7	22 *2*	78.2	2$^+$			I_γ: other: 25 *7* (1973Ca18).
		2657.9	78 *2*	0	1$^+$	D(+Q)[@]	−0.05[@] *16*	I_γ: other: 75 *7* (1973Ca18). δ: others: +0.17 *3* or −5.3 *5* (1971St33).
2740	1	521[&]	<6	2218.9	2$^+$			
		562[&]	<7	2177.6	3$^+$			
		986[&]	<7	1754.4	3$^+$			
		1417[&]	<9	1323.2	2$^+$			
		1590[&]	<10	1149.8	1$^+$			
		2227	74 *4*	512.9	0$^+$			
		2662[&]		78.2	2$^+$			E_γ: reported in 1973Ca18 only; unresolved with the 2660γ from 2660 level (1973Ca18).
		2740	26 *4*	0	1$^+$			
3004.9	3$^+$	775[&]	<1	2230	1$^+$			
		786.0[&]	<2	2218.9	2$^+$			
		827.3	4.0 *3*	2177.6	3$^+$	D(+Q)	−0.11 *16*	
		1250.5[&]		1754.4	3$^+$			E_γ,I_γ: from 1971St33 only, with Iγ=20 *5*.
		1681.7	4.4 *5*	1323.2	2$^+$	M1+E2	−1.7 *8*	

Continued on next page (footnotes at end of table)

^{29}Si(α,pγ) 1976Va09,1973Va14,1973Ca18 (continued)

$\gamma(^{32}P)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π	Mult.[#]	δ[#]	Comments
3004.9	3^+	1855.0[&]	<2	1149.8	1^+			
		2491.9[&]	<3	512.9	0^+			
		2926.6	84.9 *8*	78.2	2^+	D(+Q)	0.02 *4*	I_γ: other: 80 *5* (1971St33). Mult.,δ: from 1971St33. Others: −0.09 *9* or −3.1 *+5−2* (1976Va09).
		3004.8	6.7 *6*	0	1^+	Q(+O)	0.0 *2*	
3149.3	4^+	919[&]	<1	2230	1^+			
		930.4[&]	<1	2218.9	2^+			
		971.7	20.2 *3*	2177.6	3^+	M1+E2[@]	+0.11[@] *4*	I_γ: others: 20 *2* (1973Ca18), 21 *5* (1971St33).
		1394.9	13.4 *6*	1754.4	3^+	M1+E2[@]	+4.8[@] *12*	I_γ: others: 16 *2* (1973Ca18), 13 *5* (1971St33).
		1826.0	59.4 *6*	1323.2	2^+	E2(+M3)[@]	−0.07[@] *7*	I_γ: others: 54 *2* (1973Ca18), 66 *5* (1971St33).
		1999.4[&]	<0.5	1149.8	1^+			
		2636.3[&]	<0.4	512.9	0^+			
		3070.9	7.1 *3*	78.2	2^+	E2(+M3)[@]	+0.05[@] *10*	I_γ: other: 10 *2* (1973Ca18).
		3149.1[&]	<0.3	0	1^+			
3263.8	2	1034	10.3 *9*	2230	1^+			I_γ: other: 6 (1973Ca18).
		1044.9[&]	<3	2218.9	2^+			
		1086.2[&]	<3	2177.6	3^+			
		1509.4	11.7 *8*	1754.4	3^+			I_γ: other: 13 (1973Ca18).
		1940.5	17.1 *11*	1323.2	2^+			I_γ: other: 24 (1973Ca18).
		2113.9	44.1 *15*	1149.8	1^+	D(+Q)[@]	+0.16[@] *18*	I_γ: other: 47 (1973Ca18).
		2750.8[&]	<2	512.9	0^+			
		3185.4	14 *2*	78.2	2^+			I_γ: other: 10 (1973Ca18).
		3263.6	3.1 *9*	0	1^+			
3322.1	3^-	1092[&]	<3	2230	1^+			
		1103.2[&]	<4	2218.9	2^+			
		1567.7[&]	<4	1754.4	3^+			
		1998.8	25.5 *19*	1323.2	2^+			
		2172.2[&]	<3	1149.8	1^+			
		2809.1[&]	<4	512.9	0^+			
		3243.7	74.5 *19*	78.2	2^+	D(+Q)[@]	−0.02[@] *8*	
		3321.9[&]	<3	0	1^+			
3443.0	4^-	1213[&]	<1.5	2230	1^+			
		1224.1[&]	<1.7	2218.9	2^+			
		1265.4	6.0 *12*	2177.6	3^+	D(+Q)[@]	−0.05[@] *16*	
		1688.6	94.0 *12*	1754.4	3^+	D(+Q)[@]	−0.05[@] *3*	
		2293.1[&]	<0.8	1149.8	1^+			
		2930.0[&]	<0.9	512.9	0^+			
		3364.6[&]	<0.7	78.2	2^+			
		3442.8[&]	<0.6	0	1^+			
3445.0	(0,1,2)	1215	17 *3*	2230	1^+			
		1226.1[&]	<11	2218.9	2^+			
		1267.4[&]	<11	2177.6	3^+			

Continued on next page (footnotes at end of table)

^{29}Si(α,pγ) 1976Va09,1973Va14,1973Ca18 (continued)

$\gamma(^{32}P)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π	Mult.[#]	δ[#]	Comments
3445.0	(0,1,2)	1690.6[&]	<5	1754.4	3^+			
		2121.7[&]	<7	1323.2	2^+			
		2295.1[&]	<8	1149.8	1^+			
		2932.0[&]	<10	512.9	0^+			
		3366.6	44 *4*	78.2	2^+			I_γ: other: 45 *4* (1973Ca18).
		3444.8	39 *5*	0	1^+			I_γ: other: 55 *4* (1973Ca18).
3797.3	3	354.3[&]	<4	3443.0	4^-			
		475.2[&]	<5	3322.1	3^-			
		533.5[&]	<4	3263.8	2			
		648.0[&]	<4	3149.3	4^+			
		792.4[&]	<7	3004.9	3^+			
		1139.3[&]	<3	2658.0	2			
		1567[&]	<4	2230	1^+			
		1578.4[&]	<4	2218.9	2^+			
		1619.7[&]	<4	2177.6	3^+			
		2042.8[&]	<3	1754.4	3^+			
		2474.0	78.0 *12*	1323.2	2^+	D(+Q)	0.00 *3*	
		2647.4[&]	<2	1149.8	1^+			
		3284.2[&]	<1	512.9	0^+			
		3718.9	22.0 *12*	78.2	2^+	D+Q	+0.6 *5*	
		3797.1[&]	<1	0	1^+			
3881.0		3802.6	32 *5*	78.2	2^+			
		3880.8	68 *5*	0	1^+			
3988.7		2234.2[&]	<16	1754.4	3^+			
		3475.6[&]	<24	512.9	0^+			I_γ: from 1973Ca18.
		3910.2	>84	78.2	2^+			I_γ: other: >76 (1973Ca18).
4007		743	20	3263.8	2			I_γ: from 1973Ca18.
		3929	40	78.2	2^+			I_γ: from 1973Ca18.
		4007	40	0	1^+			I_γ: from 1973Ca18.
4034.6	4^+,(2^+)	2280.1	65 *2*	1754.4	3^+	D(+Q)		Mult.,δ: δ(Q/D)=0.00 *3* for J=4 (1976Va09).
		3956.1	35 *2*	78.2	2^+	Q(+O)		Mult.,δ: δ(O/Q)=−0.09 *9* or −10 *+4−20* for J=4.
4036		2886	19	1149.8	1^+			I_γ: from 1973Ca18.
		3523	75	512.9	0^+			I_γ: from 1973Ca18.
		3958	6	78.2	2^+			I_γ: from 1973Ca18.
4148.8	3^-	999.5[&]	<9	3149.3	4^+			
		1143.9[&]	<6	3004.9	3^+			
		1490.8	13.3 *10*	2658.0	2			
		1919[&]	<7	2230	1^+			
		1929.8	10.8 *12*	2218.9	2^+			
		1971.1[&]	<4	2177.6	3^+			
		2394.3[&]	<3	1754.4	3^+			
		2825.5[&]	<3	1323.2	2^+			
		2998.9[&]	<3	1149.8	1^+			
		3635.7[&]	<2	512.9	0^+			
		4070.3	75.9 *14*	78.2	2^+	D+Q	+0.12 *7*	I_γ: other: 100 (1973Ca18).
		4148.5[&]	<2	0	1^+			
4203		2025	<56	2177.6	3^+			

Continued on next page (footnotes at end of table)

^{29}Si(α,pγ) 1976Va09,1973Va14,1973Ca18 (continued)

$\gamma(^{32}P)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π	Mult.[#]	δ[#]	Comments
4203		4125	>44	78.2	2^+			
4275.2	5^-	832.2	77.0 *12*	3443.0	4^-	M1+E2	−0.14 *2*	
		953.1[&]	<3	3322.1	3^-			
		1011.4[&]	<3	3263.8	2			
		1125.9	23.0 *12*	3149.3	4^+	D(+Q)	+0.07 *7*	
		1270.3[&]	<5	3004.9	3^+			
		1617.2[&]	<3	2658.0	2			
		2045[&]	<3	2230	1^+			
		2056.2[&]	<5	2218.9	2^+			
		2097.5[&]	<5	2177.6	3^+			
		2520.7[&]	<2	1754.4	3^+			
		2951.9[&]	<2	1323.2	2^+			
		3125.2[&]	<2	1149.8	1^+			
		3762.1[&]	<2	512.9	0^+			
		4196.7[&]	<2	78.2	2^+			
		4274.9[&]	<2	0	1^+			
4312.5		4234.0	100	78.2	2^+			
4554.4		1549.5	38 *2*	3004.9	3^+			
		1896.3	16 *2*	2658.0	2			
		2335.4	12 *2*	2218.9	2^+			
		2376.7	34 *2*	2177.6	3^+			
4697.0		662.4	7.8 *6*	4034.6	4^+,(2^+)			
		1254.0	82.5 *10*	3443.0	4^-			
		1547.7	9.7 *9*	3149.3	4^+			
4743.3	5^+,(3^+)	708.7	12.3 *7*	4034.6	4^+,(2^+)	D(+Q)	−0.03 *5*	Mult.,δ: for J(4743)=5 and J(4035)=4 (1976Va09).
		1300.3[&]	<3	3443.0	4^-			
		1421.2[&]	<4	3322.1	3^-			
		1479.5[&]	<4	3263.8	2			
		1594.0	46.8 *13*	3149.3	4^+	M1+E2	−0.12 *4*	δ: for J(4743)=5.
		1738.4	12.2 *11*	3004.9	3^+			δ: δ(O/Q)=−0.06 *6* for J(4743)=5; M2(+E3) ruled out by RUL.
		2085.2[&]	<6	2658.0	2			
		2513[&]	<4	2230	1^+			
		2524.3[&]	<4	2218.9	2^+			
		2565.6	28.7 *11*	2177.6	3^+			Mult.,δ: δ(O/Q)=−0.08 *5* for J(4743)=5, but the mixture of either M2+E3 or E2+M3 is ruled out by RUL, therefore it could be only pure E2 for J=5 since M2 is also ruled out by RUL.
		2988.8[&]	<4	1754.4	3^+			
		3419.9[&]	<4	1323.2	2^+			
		3593.3[&]	<4	1149.8	1^+			
		4230.1[&]	<4	512.9	0^+			
		4664.7[&]	<3	78.2	2^+			
		4742.9[&]	<3	0	1^+			
4849.9		1700.6	44.3 *12*	3149.3	4^+			
		2672.2	22.5 *10*	2177.6	3^+			

Continued on next page (footnotes at end of table)

^{29}Si(α,pγ) 1976Va09,1973Va14,1973Ca18 (continued)

$\gamma(^{32}P)$ (continued)

E_i(level)	E_γ [†]	I_γ [‡]	E_f	J^π_f
4849.9	3095.3	33.2 *11*	1754.4	3^+
5081.5	1759.4	61 *3*	3322.1	3^-
	3326.9	39 *3*	1754.4	3^+
5252.9	1809.9	100	3443.0	4^-

[†] From level-energy differences, unless otherwise noted. Note that level energies with uncertainties are reported in these references based on measured Eγ values, which however are not listed explicitly in those references.
[‡] From 1973Va14 up to 3444 level and from 1976Va09 above that, unless otherwise noted.
[#] From p$\gamma(\theta)$ in 1976Va09 with magnetic or electric natures determined based on RUL and measured $T_{1/2}$ where available, unless otherwise noted. See 1976Va09 for different sets of A_2 and A_4 values from p$\gamma(\theta)$ measured at different beam energies.
[@] From 1973Va14 with magnetic or electric natures determined based on RUL and measured $T_{1/2}$ where available.
[&] Placement of transition in the level scheme is uncertain.

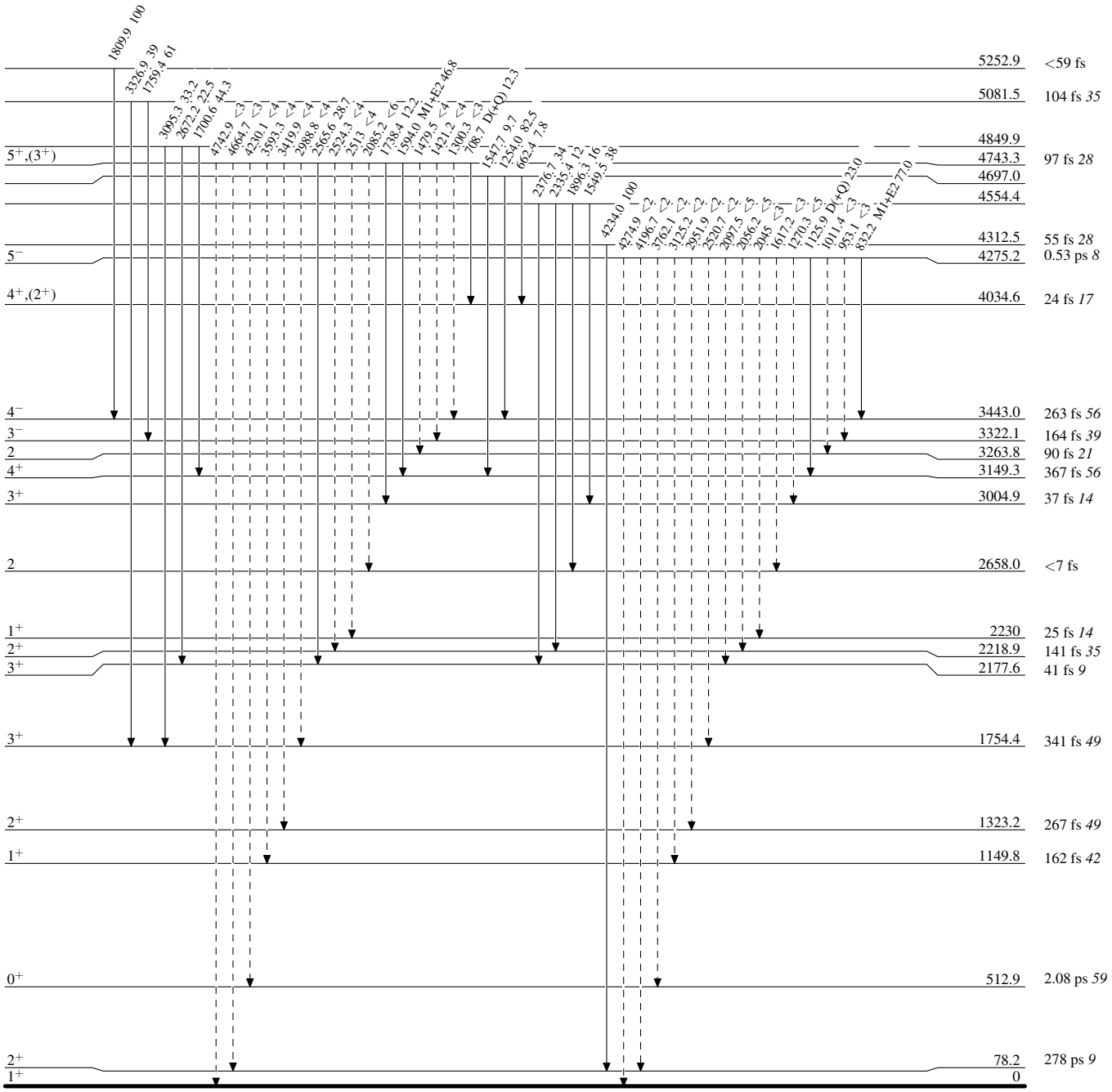
^{29}Si(α,pγ) 1976Va09,1973Va14,1973Ca18

Legend

Level Scheme

Intensities: % photon branching from each level

γ Decay (Uncertain)



$^{32}_{15}P_{17}$

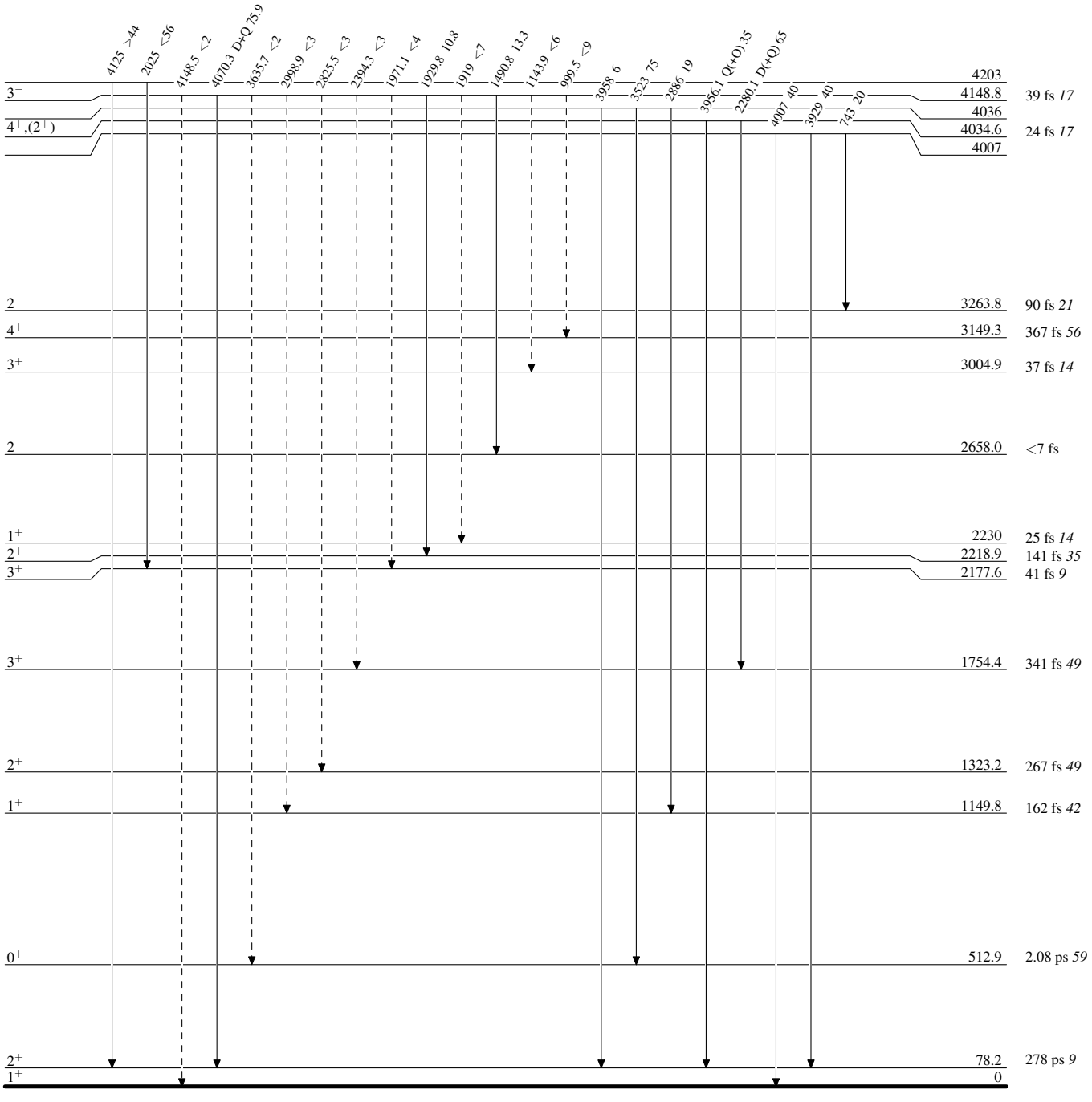
^{29}Si(α,pγ) 1976Va09,1973Va14,1973Ca18

Legend

Level Scheme (continued)

Intensities: % photon branching from each level

γ Decay (Uncertain)



$^{32}_{15}P_{17}$

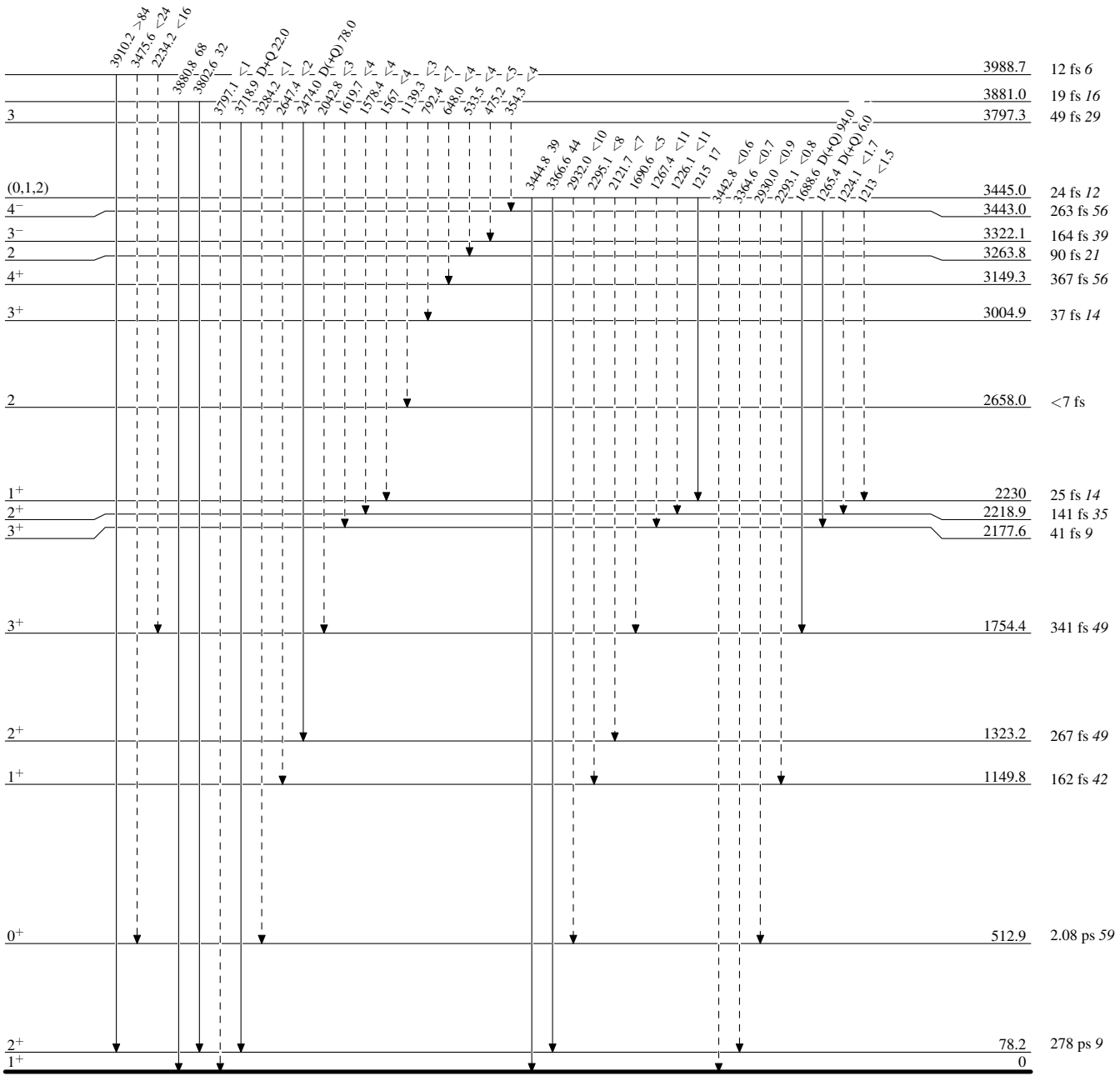
^{29}Si(α,pγ) 1976Va09,1973Va14,1973Ca18

Legend

Level Scheme (continued)

Intensities: % photon branching from each level

– – – – – – ► γ Decay (Uncertain)



$^{32}_{15}P_{17}$

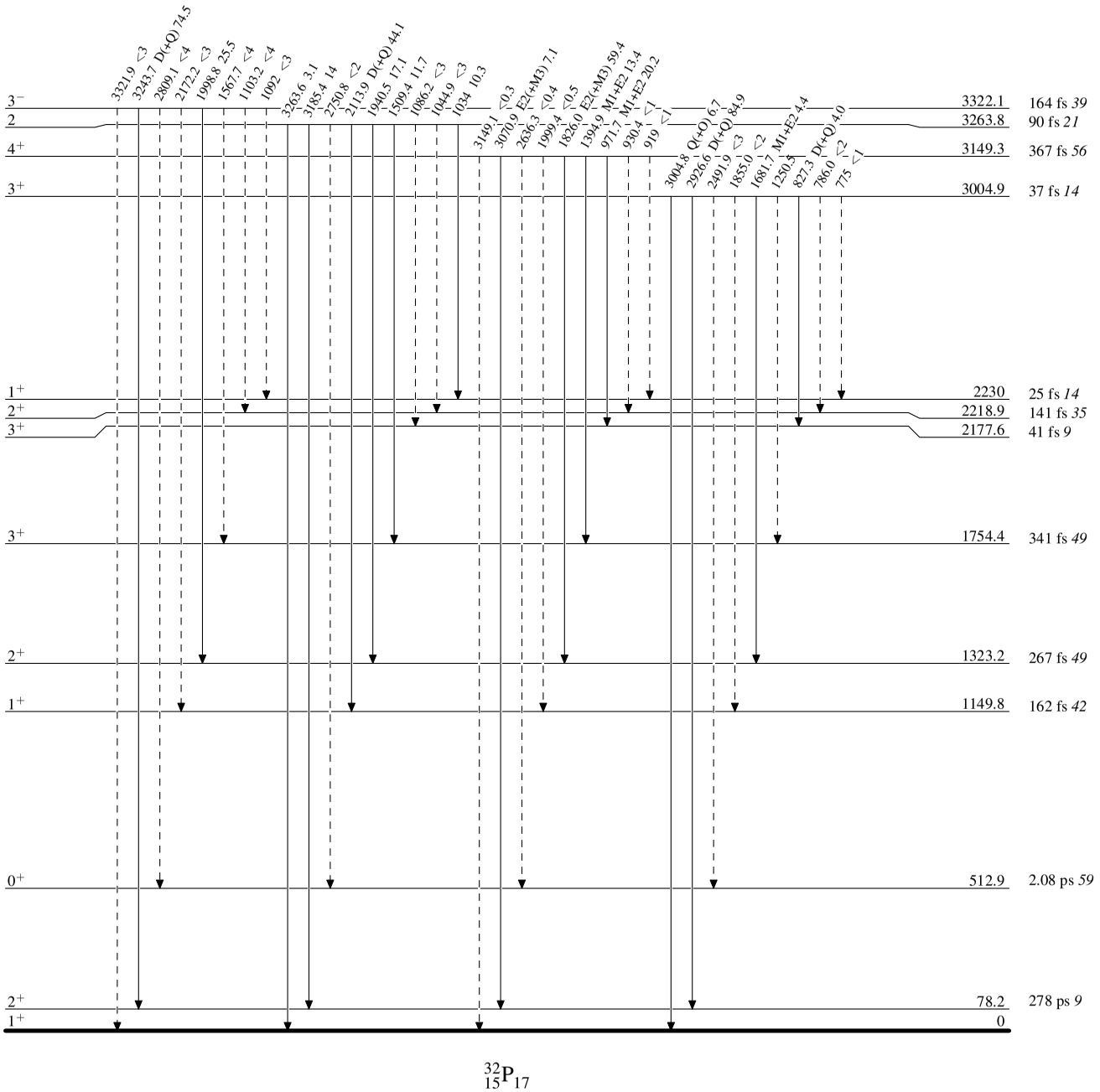
^{29}Si(α,pγ) 1976Va09,1973Va14,1973Ca18

Legend

Level Scheme (continued)

Intensities: % photon branching from each level

γ Decay (Uncertain)



$^{32}_{15}P_{17}$

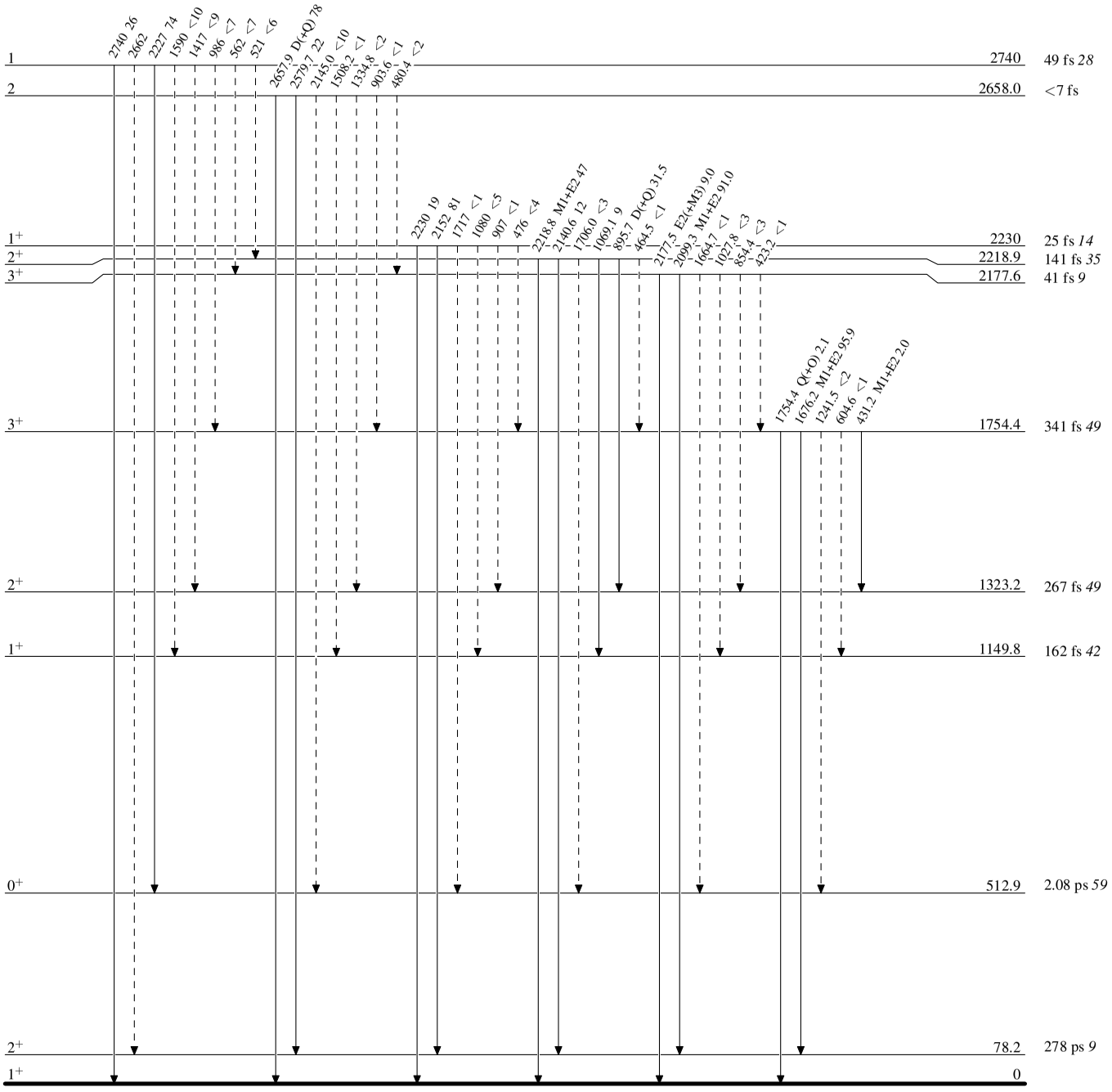
^{29}Si(α,pγ) 1976Va09,1973Va14,1973Ca18

Legend

Level Scheme (continued)

Intensities: % photon branching from each level

γ Decay (Uncertain)



$^{32}_{15}P_{17}$

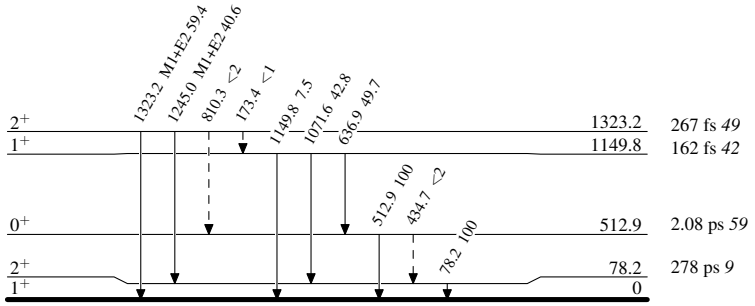
^{29}Si(α,pγ) 1976Va09,1973Va14,1973Ca18

Legend

Level Scheme (continued)

Intensities: % photon branching from each level

γ Decay (Uncertain)



$^{32}_{15}P_{17}$