^{40}Ar(α,nγ) 1979Be27

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen[#]	NDS 126, 1 (2015)	31-Mar-2015

1979Be27 (also 1978Be16): E=5.5-19 MeV α beam was produced at the Oliver Lodge Laboratory of University of Liverpool. Target of solid natural argon (3-5 mg/cm^2) on 250 μm thick Au or Ta backings. γ-rays were detected in a Ge(Li) detector. Measured Eγ, Iγ, γγ, γ(θ), γ(lin pol). Deduced levels, J, π, γ-branching ratios, $T_{1/2}$ by DSAM.

Others:

1974Sc09: E=8.5 MeV. Measured $T_{1/2}$ by DSAM.

1972Al12: E=13.5 MeV. Measured Eγ, Iγ, γγ, γ(θ).

1972Bi13: E=5.5-8 MeV. Measured γ, ce, $T_{1/2}$ by DSAM.

1972Ka41, 1969Ka18: E=6.3-8.0 MeV. Measured $T_{1/2}$ by DSAM.

1976Fi08: ^{40}Ar(α,n) E=24.1 MeV. Measured σ(E_n,θ).

1987Wa29: ^{40}Ar(α,n) E=26 MeV. Measured σ(E_n,θ).

^{43}Ca Levels

A 1984.8 level (decaying by a 1985γ) proposed by 1972Al12 is not supported by the γγ coin and excitation function data of 1979Be27. From γγ data, the 1985γ is assigned by 1979Be27 from the 3663 level.

E(level)[†]	J^π[‡]	$T_{1/2}$[a]	Comments
0.0	7/2$^-$		
372.76 *14*	5/2$^-$	34 ps *3*	$T_{1/2}$: weighted average of 29 ps *6* (1974Sc09), 35 ps *3* (1972Bi13).
593.48 *14*	3/2$^-$	81 ps *4*	$T_{1/2}$: weighted average of 98 ps *10* (1974Sc09), 80 ps *4* (1972Bi13), 71 ps *9* (1972Ka41).
990.31 *18*	3/2$^+$	48 ps *4*	$T_{1/2}$: weighted average of 64 ps *7* (1974Sc09), 46 ps *3* (1972Bi13), 45 ps *6* (1972Ka41).
1394.78 *20*	5/2$^+$	2.4 ps *8*	$T_{1/2}$: other: 3.4 ps *6* (1972Ka41).
1677.7 *4*	11/2$^-$	1.5 ps *9*	
1902.06 *25*	7/2$^+$	0.50 ps *13*	
1931.85 *24*	5/2$^-$	0.125 ps *35*	
1957.4 *4*	1/2$^+$	1.07 ps *32*	
2046.1 *3*	3/2$^-$	0.83 ps *24*	
2067.5 *5*	7/2$^-$	<28 fs	$T_{1/2}$: other: <12 ps (1972Ka41).
2094.0 *5*	9/2$^-$	1.5 ps *4*	
2102.8 *4*	3/2$^-$	0.33 ps *9*	
2223.8 *4*	(3/2,5/2)$^-$	28 fs *17*	
2249.4 *4*	9/2$^-$	24 fs *17*	
2273.0 *4*	(3/2,5/2)$^+$	0.28 ps *8*	
2409.8 *4*	9/2$^+$	1.1 ps *4*	
2611.1 *4*		0.13 ps *5*	
2675.0 *8*		87 fs *42*	
2696.9 *6*		<38 fs	
2753.9 *5*	15/2$^-$		
2769.7 *5*		0.10 ps *4*	
2844.8 *5*		0.55 ps *15*	
2879.2 *6*		0.107 ps *38*	
2943.6 *5*		<60 fs	
2951.3 *4*	11/2$^+$	4.7 ps *12*	
3028.7 *9*		<60 fs	
3049.6 *15*		<60 fs	
3050.7 *5*	11/2$^-$	<17 fs	
3076.0 *15*		<17 fs	
3096.1 *7*		<17 fs	
3097.1 *7*		0.76 ps *20*	

Continued on next page (footnotes at end of table)

^{40}Ar(α,nγ) 1979Be27 (continued)

^{43}Ca Levels (continued)

E(level)[†]	Jπ[‡]	T1/2[a]	E(level)[†]	Jπ[‡]	T1/2[a]
3195.7 *5*		0.12 ps *4*	4175.0 *11*		
3286.0 *10*		<60 fs	4186.4 *5*	15/2+	0.13 ps *5*
3315.6 *11*		0.13 ps *6*	4394.8 *6*	15/2−	42 fs *17*
3371.1 *4*	13/2+	>3.5 ps	4590.8 *5*	17/2+	0.21 ps *5*
3376.8 *10*			4621.0 *6*	15/2+	76 fs *28*
3505.2 *5*	13/2+	73 fs *24*	5155.4 *6*	13/2−,17/2−[#]	76 fs *28*
3662.5 *5*	13/2−	49 fs *21*	5394.6 *11*		0.104 ps *31*
3816.2 *8*		69 fs *38*	5555.2 *7*	(15/2,19/2)+	1.4 ps *4*
3943.6 *5*	15/2+	0.76 ps *21*	5931.5 *8*	(11/2,15/2,19/2)− [@]	55 fs *17*
4135.9 *7*		<0.26 ps	6223.4 *9*	(17/2,21/2)+ [&]	0.58 ps *15*

[†] From least-squares fit to Eγ data.
[‡] From γ(θ) and γ(lin pol) (1979Be27).
[#] No observed transitions to J≤11/2 and excitation function favors 17/2.
[@] No observed transitions to J<11/2 and excitation function favors 19/2.
[&] No observed transitions to J<13/2 and excitation function favors 21/2.
[a] From DSAM method (1979Be27) unless otherwise noted.

γ(^{43}Ca)

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.†	δ†	Comments
372.76	5/2⁻	372.7 2	100	0.0	7/2⁻	M1+E2	−0.161 14	Mult.,δ: from Adopted Gammas; sign(δ) from $\gamma(\theta$,pol). A_2=+0.01 1, A_4=−0.02 1. Pol=−0.06 1.
593.48	3/2⁻	220.7 2	29.1 5	372.76	5/2⁻	M1(+E2)	−0.07 7	A_2=+0.01 1, A_4=−0.03 1. Pol=−0.08 3.
		593.5 2	70.9 5	0.0	7/2⁻	E2		A_2=+0.08 1, A_4=−0.02 1. Pol=+0.08 1. δ(O/Q)≈0.
990.31	3/2⁺	396.9 2	12.6 3	593.48	3/2⁻	E1		δ(M2/E1)=−0.1 1. A_2=+0.07 1, A_4=−0.02 1. Pol=−0.16 5.
		617.1 4	87.4 3	372.76	5/2⁻	E1		δ(M2/E1)=−0.02 2. A_2=−0.05 1, A_4=+0.01 1. Pol=+0.09 1.
1394.78	5/2⁺	404.3 3	11.7 4	990.31	3/2⁺	M1+E2	+0.32 5	A_2=+0.14 1, A_4=+0.02 1. Pol=−0.47 6.
		801.2 4	5.7 4	593.48	3/2⁻	E1		δ(M2/E1)=−0.03 4. A_2=−0.21 2, A_4=+0.02 2. Pol=+0.35 12.
		1021.6 4	77.6 4	372.76	5/2⁻	E1		δ(M2/E1)=+0.11 12. A_2=+0.25 1, A_4=−0.02 1. Pol=−0.31 3.
		1394.8 4	11.7 4	0.0	7/2⁻	E1		δ(M2/E1)=0. A_2=−0.25 3, A_4=+0.09 3. Pol=+0.12 19.
1677.7	11/2⁻	1677.7 6	100	0.0	7/2⁻	E2		δ(O/Q)=−0.02 2. A_2=+0.33 2, A_4=−0.10 2. Pol=+0.53 2.
1902.06	7/2⁺	507	17 4	1394.78	5/2⁺			
		911.6 3	13 4	990.31	3/2⁺	E2		δ(O/Q)=−0.02 3. A_2=+0.54 4, A_4=−0.25 4.
		1902.1 5	70‡ 4	0.0	7/2⁻	E1		δ(M2/E1)=+0.03 4. A_2=+0.33 1, A_4=−0.01 1. Pol=−0.45 12.
1931.85	5/2⁻	1338.4 5	6.6 10	593.48	3/2⁻	M1+E2	+2.2 25	A_2=+0.52 8, A_4=+0.12 7.
		1559.6 5	35.1 10	372.76	5/2⁻	M1+E2	+0.28 14	A_2=+0.43 2, A_4=−0.03 1. Pol=+0.48 17.
		1931.6 3	58.3 10	0.0	7/2⁻	M1+E2	−0.8 3	A_2=+0.31 1, A_4=+0.02 1. Pol=−0.36 12.
1957.4	1/2⁺	967.1 4	28 1	990.31	3/2⁺			
		1364.0 5	100 1	593.48	3/2⁻			
2046.1	3/2⁻	651.0 4	2	1394.78	5/2⁺			
		1056.0 5	7	990.31	3/2⁺	E1		δ(M2/E1)=0.00 3. A_2=+0.40 5, A_4=−0.11 4.
		1451	8	593.48	3/2⁻			
		1675	20	372.76	5/2⁻			
		2046.6 9	63‡	0.0	7/2⁻	E2		δ(O/Q)=0.00 2. A_2=+0.08 1, A_4=0.00 1. Pol=+0.25 7.
2067.5	7/2⁻	1694.7 6	21.9 9	372.76	5/2⁻	M1+E2	−0.90 24	A_2=−0.94 3, A_4=+0.12 3. Pol=+0.25 11.
		2067.5 6	78.1 9	0.0	7/2⁻	M1+E2	−0.10 6	A_2=+0.32 1, A_4=+0.01 1. Pol=+0.96 12.
2094.0	9/2⁻	2094.2 8	100	0.0	7/2⁻	M1+E2	−5.9 11	A_2=−0.19 2, A_4=+0.16 2. Pol=+0.09 5.
2102.8	3/2⁻	1509.2 5	25	593.48	3/2⁻	M1+E2	+2.0 17	δ: +0.3 to +3.7. A_2=+0.27 2, A_4=−0.05 3. Pol=−0.03 12.
		1730.1 6	50	372.76	5/2⁻			A_2=+0.09 2, A_4=−0.07 2. Pol=−0.20 8.
		2102.9 5	25	0.0	7/2⁻			

γ(^{43}Ca) (continued)

E_i(level)	J^π_i	E_γ	I_γ	E_f	J^π_f	Mult.†	δ†	Comments
2223.8	(3/2,5/2)$^-$	1630.3 5	57.3 13	593.48	3/2$^-$	M1+E2		δ: −0.50 25 for J=5/2; +0.8 +4−10 for J=3/2. A_2=−0.48 1, A_4=+0.01 1. Pol=+0.01 5.
		1851.0 6	42.7 13	372.76	5/2$^-$	M1+E2		δ: −0.20 5 for J=5/2; >+11, or <−5.6 for J=3/2. A_2=+0.11 2, A_4=+0.01 2. Pol=+0.35 9.
2249.4	9/2$^-$	1876.8 6	11 1	372.76	5/2$^-$	E2		δ(O/Q)=−0.01 3. A_2=+0.40 6, A_4=−0.34 8. Pol=+1.0 5.
		2249.5 7	89 1	0.0	7/2$^-$	M1+E2	−0.75 12	A_2=−0.85 2, A_4=+0.05 3. Pol=+0.15 7.
2273.0	(3/2,5/2)$^+$	877.8 4	16 3	1394.78	5/2$^+$	M1+E2		δ: −10 +4−13 for J=5/2; +0.1 4 for J=3/2. A_2=−0.10 1, A_4=0.00 1. Pol=−0.05 3.
		1283.3 5	84 3	990.31	3/2$^+$	M1+E2		δ: −11 +2−4 for J=5/2; −0.26 5 for J=3/2. A_2=+0.01 2, A_4=−0.03 2. Pol=+0.24 8.
2409.8	9/2$^+$	508.0 7	11# 2	1902.06	7/2$^+$			
		1015	44# 4	1394.78	5/2$^+$			
		2409.8 6	45‡ 4	0.0	7/2$^-$	E1		δ(M2/E1)=−0.03 4. A_2=−0.26 1, A_4=+0.01 1. Pol=+0.15 10.
2611.1		565.0 3		2046.1	3/2$^-$			
		2017.5 6		593.48	3/2$^-$			
2675.0		2302.2 7		372.76	5/2$^-$			
		2674.6@ 8		0.0	7/2$^-$			γ not seen in (p,p′γ).
2696.9		1706.2 6	36.6 9	990.31	3/2$^+$			
		2324.9 9	63.4 9	372.76	5/2$^-$			A_2=+0.26 2, A_4=+0.02 2. Pol=−0.61 12.
2753.9	15/2$^-$	1076.0 5	100	1677.7	11/2$^-$	E2		δ(O/Q)=−0.02 2. A_2=+0.36 1, A_4=−0.14 1. Pol=+0.60 3.
2769.7		1779.1 6		990.31	3/2$^+$			
		2176.6 8		593.48	3/2$^-$			
2844.8		750.9@		2094.0	9/2$^-$			γ treated as uncertain (by evaluators) in view of adopted J^π(2844)= (5/2)$^+$ and J^π(2094)=9/2$^-$.
		942.1 6		1902.06	7/2$^+$			
		1450.0		1394.78	5/2$^+$			
		2845.7 11		0.0	7/2$^-$			
2879.2		922.1 6		1957.4	1/2$^+$			
		2285.0 10		593.48	3/2$^-$			
2943.6		2350.4 6		593.48	3/2$^-$			
		2570.1 8		372.76	5/2$^-$			
2951.3	11/2$^+$	541.5 3	14 1	2409.8	9/2$^+$	M1+E2	−0.04 2	A_2=−0.16 1, A_4=+0.03 1. Pol=−0.20 13.
		857.4 4	65 1	2094.0	9/2$^-$	E1		δ(M2/E1)=0.00 2. A_2=−0.15 1, A_4=+0.01 1. Pol=+0.39 3.
		1048.9 5	21 1	1902.06	7/2$^+$			
3028.7		2655.9 8	100	372.76	5/2$^-$			A_2=+0.32 2, A_4=−0.05 2. Pol=+0.48 10.
3049.6		3049.5 15	100	0.0	7/2$^-$			
3050.7	11/2$^-$	801.7 7	12 2	2249.4	9/2$^-$			
		1373.0 6	53 2	1677.7	11/2$^-$	M1+E2	+0.30 5	A_2=+0.42 2, A_4=−0.02 1. Pol=+0.50 10.

γ(^{43}Ca) (continued)

E_i(level)	J^π_i	E_γ	I_γ	E_f	J^π_f	Mult.†	δ†	Comments
3050.7	11/2⁻	3049.7 *11*	36 *2*	0.0	7/2⁻	E2		δ(O/Q)=−0.02 *2*.
3076.0		3075.9 *15*	100	0.0	7/2⁻			A_2=+0.37 *2*, A_4=−0.04 *2*. Pol=−0.50 *16*.
3096.1		2502.4 *8*		593.48	3/2⁻			
		2723.4 *11*		372.76	5/2⁻			
3097.1		687.3 *7*		2409.8	9/2⁺			
		1195.0 *10*		1902.06	7/2⁺			Pol=+0.45 *10*.
3195.7		350.7 *4*		2844.8				
		1294.1 *7*		1902.06	7/2⁺			
3286.0		1239.9 *9*		2046.1	3/2⁻			
3315.6		1269.5 *10*		2046.1	3/2⁻			
3371.1	13/2⁺	419.5 *5*	21.0 *12*	2951.3	11/2⁺			
		617.1 *7*	26.0 *12*	2753.9	15/2⁻			
		961.6 *8*	41.0 *12*	2409.8	9/2⁺	E2		δ(O/Q)=0.00 *2*.
								A_2=+0.27 *2*, A_4=−0.13 *2*. Pol=+0.55 *7*.
		1693.7 *9*	12.0 *12*	1677.7	11/2⁻			
3376.8		1282.8 *9*		2094.0	9/2⁻			
3505.2	13/2⁺	554.1 *5*	12 *2*	2951.3	11/2⁺	M1+E2	−0.06 *2*	A_2=−0.30 *3*, A_4=−0.07 *4*. Pol=0.00 *3*.
		751.1 *6*	13 *2*	2753.9	15/2⁻			
		1827.4 *9*	75 *2*	1677.7	11/2⁻	E1		δ(M2/E1)=−0.03 *3*.
								A_2=−0.15 *1*, A_4=0.00 *1*. Pol=+0.41 *6*.
3662.5	13/2⁻	612.0 *7*	12 *2*	3050.7	11/2⁻			
		908.0 *9*	13 *2*	2753.9	15/2⁻			
		1412.9 *7*	14 *2*	2249.4	9/2⁻			
		1984.8 *9*	61 *2*	1677.7	11/2⁻	M1+E2	−0.60 *14*	A_2=−0.92 *3*, A_4=+0.11 *4*. Pol=−0.03 *10*.
3816.2		1406.4 *7*		2409.8	9/2⁺			
3943.6	15/2⁺	438.5 *4*	51 *7*	3505.2	13/2⁺	M1(+E2)	0.00 *2*	A_2=−0.24 *2*, A_4=−0.01 *2*. Pol=−0.34 *5*.
		572.2 *6*	34 *7*	3371.1	13/2⁺			
		1189.8 *7*	15 *7*	2753.9	15/2⁻			
4135.9		1184.6 *6*		2951.3	11/2⁺			
4175.0		1902.0 *10*		2273.0	(3/2,5/2)⁺			
4186.4	15/2⁺	681.1 *4*	14 *3*	3505.2	13/2⁺			
		815.4 *6*	86 *3*	3371.1	13/2⁺	M1+E2	−0.15 *2*	A_2=−0.50 *2*, A_4=−0.01 *2*. Pol=−0.28 *5*.
4394.8	15/2⁻	731.9 *5*	22 *3*	3662.5	13/2⁻			
		1641.1 *7*	37 *3*	2753.9	15/2⁻	M1+E2	−0.50 *14*	A_2=+0.43 *7*, A_4=−0.17 *7*. Pol=+0.56 *25*.
		2717.4 *12*	41 *3*	1677.7	11/2⁻	E2		δ(O/Q)=0.00 *2*.
								A_2=+0.49 *7*, A_4=−0.18 *6*. Pol=+0.96 *30*.
4590.8	17/2⁺	404.4 *4*	24 *5*	4186.4	15/2⁺			
		647.2 *5*	49 *5*	3943.6	15/2⁺	M1(+E2)	0.00 *2*	A_2=−0.30 *1*, A_4=−0.03 *2*. Pol=−0.47 *7*.
		1837.4 *9*	27 *5*	2753.9	15/2⁻	E1		δ(M2/E1)=0.00 *2*.
4621.0	15/2⁺	677.4 *4*	28 *4*	3943.6	15/2⁺			
		1249.9 *7*	72 *4*	3371.1	13/2⁺	M1(+E2)	−0.02 *3*	A_2=−0.26 *5*, A_4=+0.07 *6*. Pol=−0.47 *20*.
5155.4	13/2⁻,17/2⁻	760.4 *5*	65 *3*	4394.8	15/2⁻	M1+E2		δ: −0.08 *2* or −0.15 *2*.
								A_2=−0.36 *2*, A_4=−0.05 *2*. Pol=−0.20 *10*.

γ(^{43}Ca) (continued)

E_i(level)	J^π_i	E_γ	I_γ	E_f	J^π_f	Mult.†	Comments
5155.4	13/2⁻,17/2⁻	1493.1 *6*	35 *3*	3662.5	13/2⁻		δ: 0.00 *2* for 17/2 to 13/2, but no $\gamma(\theta)$ data quoted.
5394.6		2640.6 *10*		2753.9	15/2⁻		
5555.2	(15/2,19/2)⁺	964.5 *6*	<60	4590.8	17/2⁺		
		1611.4 *7*	>40	3943.6	15/2⁺	M1,E2	δ: 0.00 *2* for 19/2⁺ to 15/2⁺; +0.7 *1* for 15/2⁺ to 15/2⁺. A_2=+0.37 *5*, A_4=−0.19 *6*. Pol=+0.37 *25*.
5931.5	(11/2,15/2,19/2)⁻	776.1 *5*	100	5155.4	13/2⁻,17/2⁻	M1(+E2)	δ: −0.03 *2*; +0.07 *3*; −0.11 *2* for different J^π values. A_2=−0.28 *3*, A_4=−0.01 *4*. Pol=−0.33 *18*.
6223.4	(17/2,21/2)⁺	668.2 *5*	100	5555.2	(15/2,19/2)⁺	M1(+E2)	δ: −0.02 *3*; +0.06 *3*; +0.09 *3* for different J^π values. A_2=−0.27 *4*, A_4=−0.05 *5*. Pol=−0.40 *17*.

† From $\gamma(\theta)$ and γ(lin pol) (1979Be27).

‡ Quoted by 1979Be27 from 1978En02.

I(508γ)=44 *4* and I(1015γ)=11 *2* in 1979Be27 could be mistakenly assigned to each other. Values seem to be from (p,p′γ) (1972Gr04).

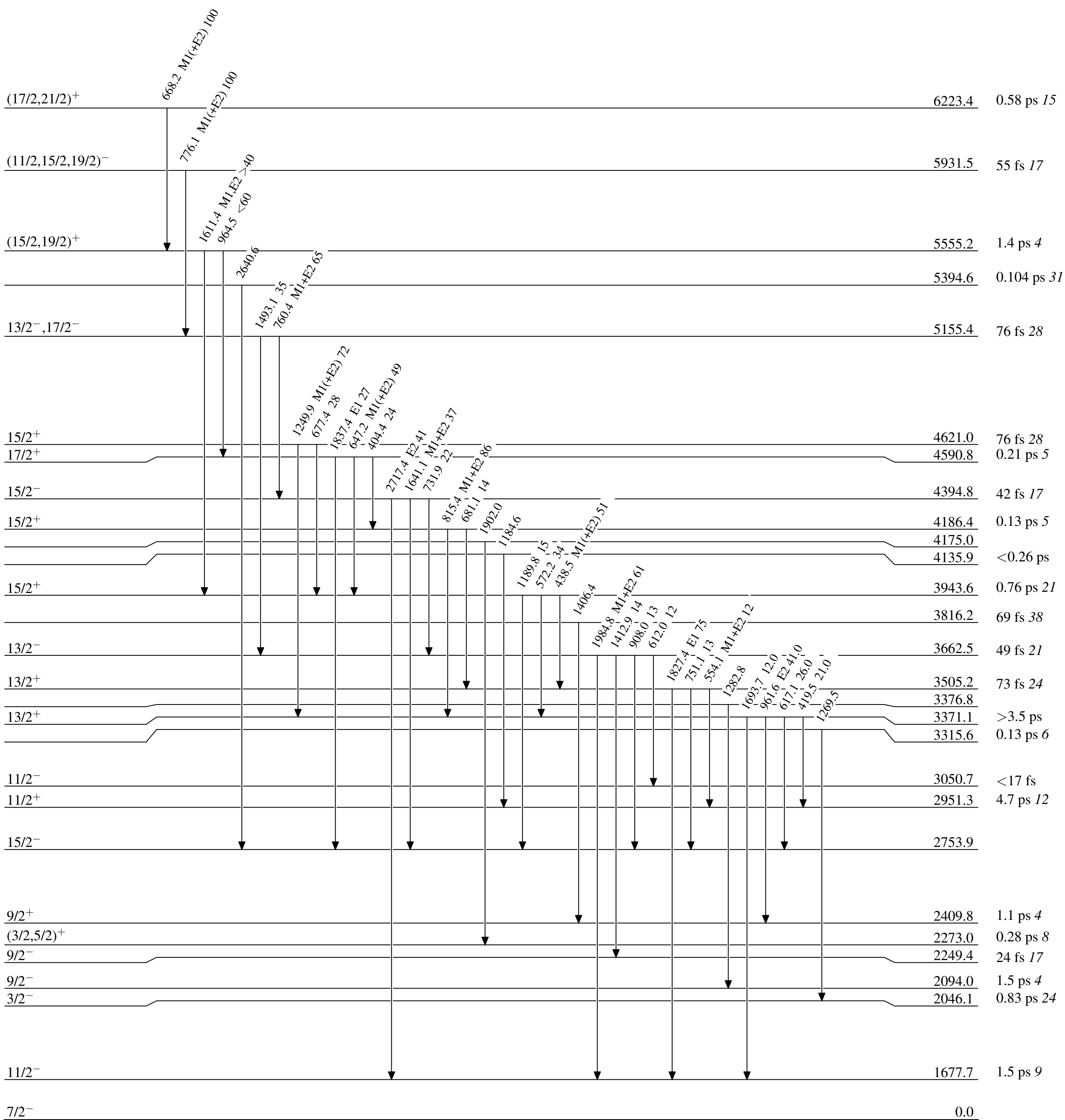
@ Placement of transition in the level scheme is uncertain.

$^{43}_{20}$Ca$_{23}$-6

^{40}Ar(α,nγ) 1979Be27

Level Scheme

Intensities: % photon branching from each level



$^{43}_{20}Ca_{23}$

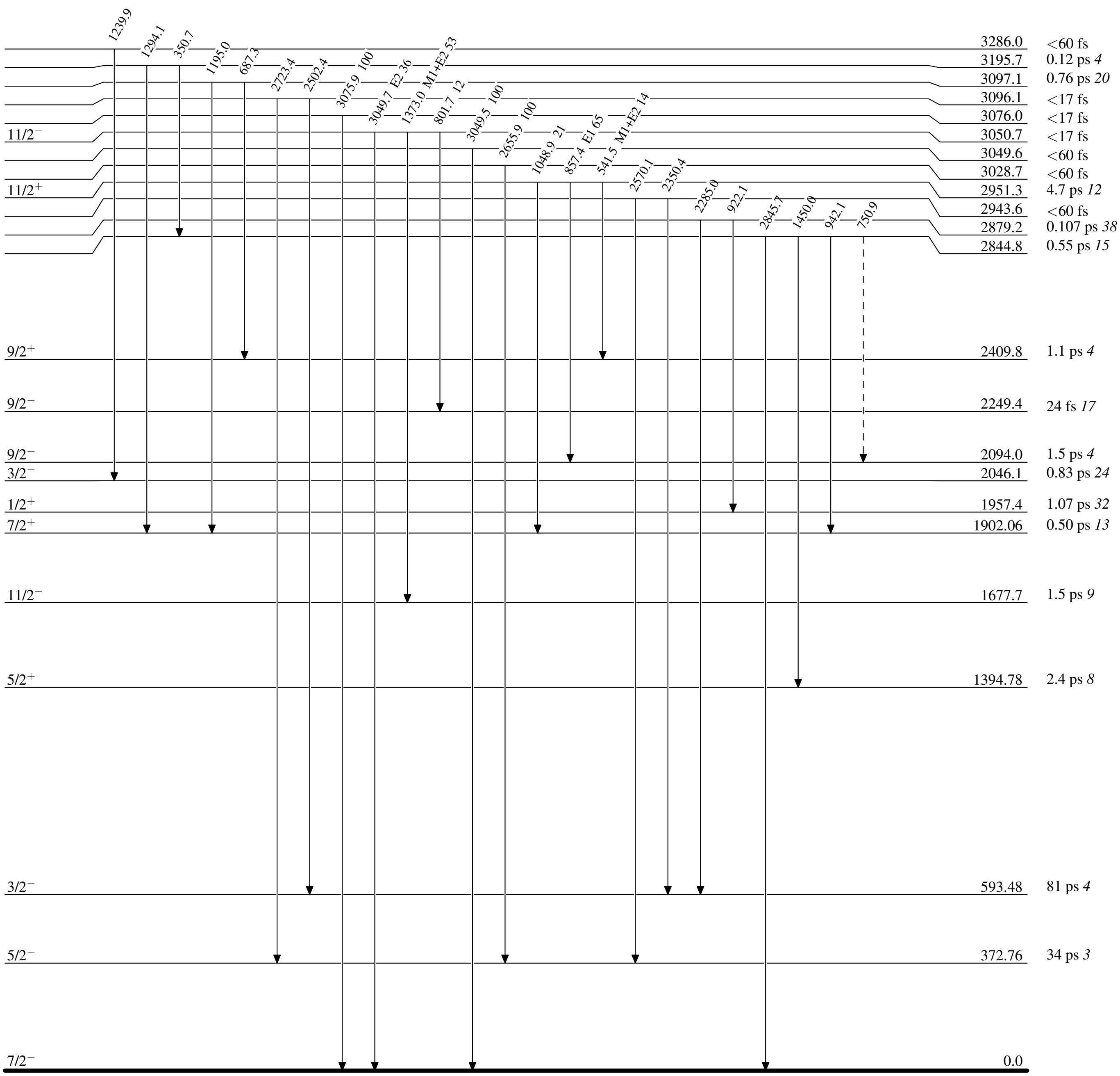
^{40}Ar(α,nγ) **1979Be27**

Legend

Level Scheme (continued)

Intensities: % photon branching from each level

- - - - - ► γ Decay (Uncertain)



$^{43}_{20}Ca_{23}$

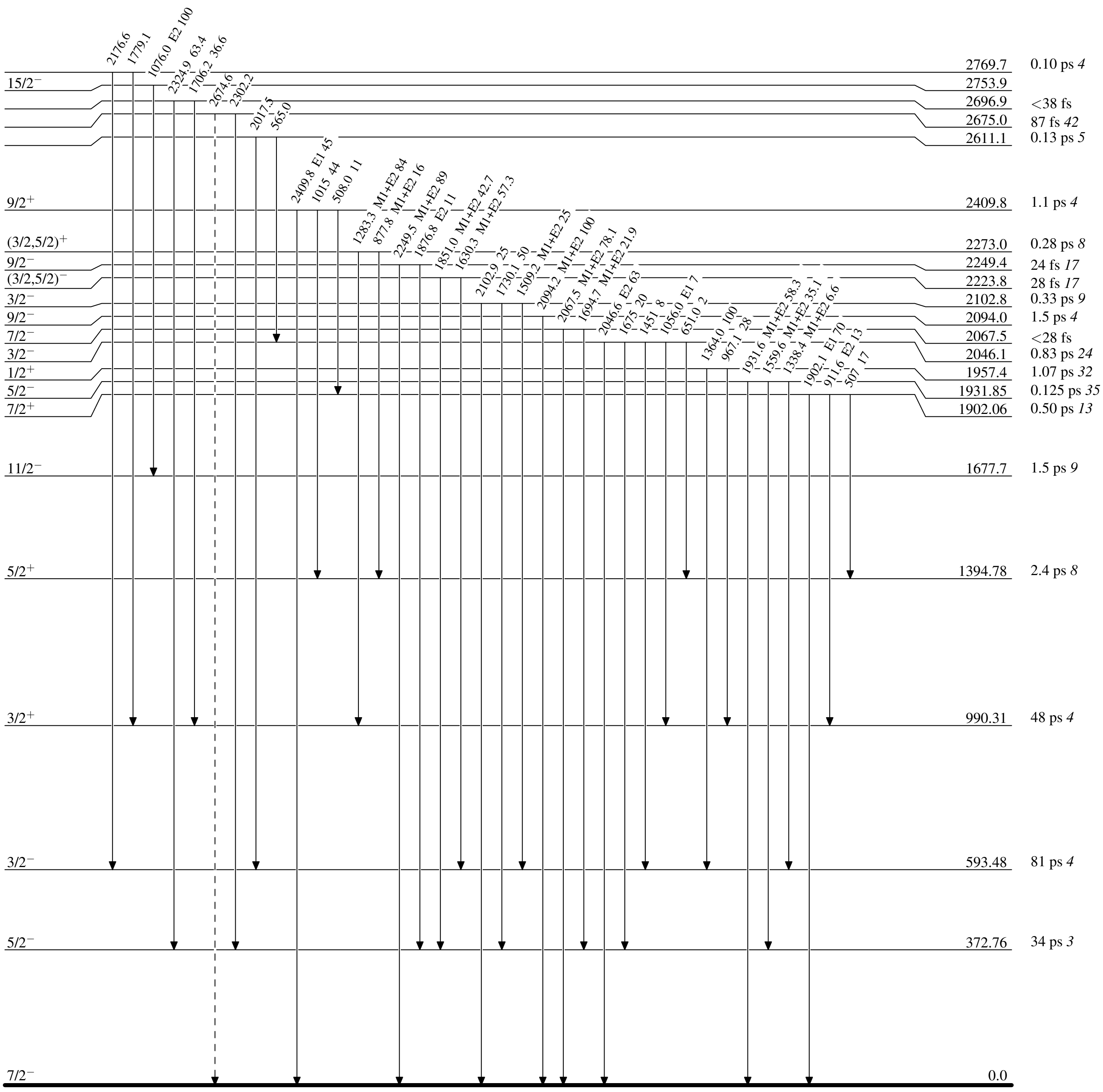
$^{40}Ar(\alpha,n\gamma)$ 1979Be27

Legend

Level Scheme (continued)

Intensities: % photon branching from each level

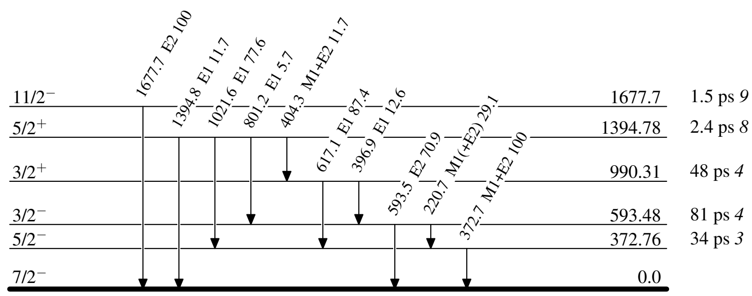
γ Decay (Uncertain)



^{40}Ar(α,nγ) 1979Be27

Level Scheme (continued)

Intensities: % photon branching from each level



$^{43}_{20}Ca_{23}$