^{38}Ar(α,nγ) 1980Li10,1977Li07,1976Li17

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	C. D. Nesaraja, E. A. Mccutchan	NDS 133, 1 (2016)	30-Sep-2015

All references are from the same group with E(α)=7.5-14 MeV. Deduced levels, Eγ, γ, δ, τ.
1980Li10:E(α)= 9.6-13.0 MeV. Gammas detected with Ge(Li) detector and γ-ray linear polarization measured with three Ge(Li) Compton polarimeter. Measured Eγ, Iγ, $\gamma(\theta)$, γ(lin pol), δ for most of the levels.
1977Li09: $\gamma(\theta)$ and γ(lin pol) data for J^π assignments for 3369, 3830, 3914, 3976, 4519 and 5219 levels.
1976Li17:E(α)= 7.5-14.5 MeV. Measured $\gamma\gamma$ coin. and level lifetimes by Doppler-shift attenuation method (DSAM).

^{41}Ca Levels

E(level)[@]	J$^\pi$[#]	T$_{1/2}$[†]	Comments
0	7/2$^-$		
1943.0 *3*	3/2$^-$	0.42 ps *10*	
2010.2 *3*	3/2$^+$	>3.1 ps	
2462.6 *4*	3/2$^-$	2.4 ps *6*	
2576.5 *6*	5/2$^-$	107 fs *28*	
2605.8 *4*	5/2$^+$	0.27 ps *7*	
2670.9 *4*	1/2$^+$	1.7 ps *5*	
2883.9 *6*	7/2$^+$	<14 fs	
2959.3 *6*	7/2$^-$	24 fs *7*	
3050.2 *3*	3/2$^+$	0.49 ps *14*	
3201.9 *5*	9/2$^+$	35 fs *14*	
3369.6 *5*	11/2$^+$	>3.1 ps	
3400.2 *5*	1/2$^+$	<69 fs	
3495.2 *4*	5/2$^+$	0.24[‡] ps *8*	
3527.5 *9*	3/2$^+$	69[‡] fs *42*	J$^\pi$: 1980Li10 give 5/2$^-$.
3614.1 *6*	1/2$^-$		
3614.4 *8*	7/2$^+$	<17 fs	
3677.0 *6*	9/2$^-$	44 fs *12*	
3730.9 *4*	3/2$^-$	52 fs *14*	J$^\pi$: 3/2$^-$,5/2$^-$ in 1980Li10.
3740.7 *5*	(3/2,5/2)$^+$	<35 fs	
3829.9 *6*	15/2$^+$	>3.12 ps	
3914.2 *6*	13/2$^+$	1.21 ps *31*	
3974.5 *5*	7/2$^+$	24 fs *10*	
3976.4 *6*	11/2$^+$	0.23[‡] ps *7*	
4015.1 *8*	11/2$^-$	10 fs *4*	
4097.1 *7*	5/2$^+$	<28 fs	
4277.3 *10*	(5/2,7/2,9/2)$^-$	<49 fs	
4343.1 *10*	9/2$^-$	125 fs *35*	
4415.3 *7*	3/2$^+$	28 fs *24*	
4451.0 *10*	9/2$^+$	83 fs *31*	
4519.6 *6*	13/2$^+$	<49 fs	
4550.1 *10*		97 fs *28*	
4733.0 *11*	(5/2)$^+$	21 fs *10*	
4882.9 *11*	5/2$^-$	<87 fs	J$^\pi$: 3/2,5/2 in 1980Li10.
4974.9 *11*	9/2$^+$	49 fs *45*	
5057.1 *14*		0.14 ps *6*	
5119.6 *15*	3/2$^-$	0.8 ps *7*	
5154.4 *16*		<125 fs	
5219.1 *10*	(13/2,17/2)$^+$	<28 fs	
5290.3 *13*		<104 fs	
5506.5 *16*		62 fs *21*	

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^{38}Ar(α,nγ) 1980Li10,1977Li07,1976Li17 (continued)

^{41}Ca Levels (continued)

† From DSAM (1976Li17), except where noted.
‡ From DSAM (1980Li10).
# From Adopted Levels. Most of these assignments agree with those from 1980Li10 which were based on $\gamma(\theta)$ and γ(lin pol) data.
@ From least-squares fit to Eγ's.

$\gamma(^{41}Ca)$

E_i(level)	J_i^π	E_γ †	I_γ #	E_f	J_f^π	Mult. @	δ @	Comments
1943.0	3/2$^-$	1942.9 *5*	100	0	7/2$^-$	E2		A_2=−0.04 *1*, A_4=+0.01 *1*, pol=+0.14 *2*.
2010.2	3/2$^+$	2009.9 *5*	100	0	7/2$^-$	M2+E3	+0.16 *2*	A_2=−0.02 *1*, A_4=+0.01 *1*, pol=−0.10 *2*.
2462.6	3/2$^-$	519.7 *2*	100	1943.0	3/2$^-$	M1+E2	+0.03 *1*	A_2=+0.22 *1*, A_4=+0.02 *1*, pol=+0.30 *2*.
2576.5	5/2$^-$	2576.4 *6*	100	0	7/2$^-$	M1+E2		A_2=+0.30 *1*, A_4=+0.00 *1*, pol=−0.69 *7*. δ: −0.36 *8* or −1.48 *11*.
2605.8	5/2$^+$	2605.7 *6*	100	0	7/2$^-$	E1+M2	−0.03 *1*	A_2=−0.08 *1*, A_4=0.00 *1*, pol=+0.25 *4*.
2670.9	1/2$^+$	660.4 *2*	34.4 *14*	2010.2	3/2$^+$	M1		A_2=0.00 *2*, A_4=+0.03 *3*, pol=+0.05 *10*.
		728.2 *2*	65.6 *14*	1943.0	3/2$^-$	E1(+M2)		A_2=−0.02 *3*, A_4=+0.06 *4*, pol=−0.01 *5*.
2883.9	7/2$^+$	2883.8 *6*	100	0	7/2$^-$	E1+M2	−0.08 *6*	A_2=+0.39 *1*, A_4=−0.03 *1*, pol=−0.98 *7*.
2959.3	7/2$^-$	2959.2 *7*	100	0	7/2$^-$	M1+E2	−0.29 *1*	A_2=+0.17 *1*, A_4=−0.03 *1*, pol=+1.06 *11*.
3050.2	3/2$^+$	444.4 *2*	38& *3*	2605.8	5/2$^+$			
		1040.6 *3*	37& *3*	2010.2	3/2$^+$	M1		A_2=+0.01 *2*, A_4=0.00 *2*, pol=+0.11 *7*.
		1106.4 *3*	21& *2*	1943.0	3/2$^-$	E1		A_2=+0.45 *3*, A_4=−0.05 *3*, pol=−0.71 *16*.
3201.9	9/2$^+$	3201.4 *7*	100	0	7/2$^-$	E1+M2	−0.02 *1*	A_2=−0.32 *1*, A_4=−0.01 *1*, pol=+0.34 *5*.
3369.6	11/2$^+$	167.7 *1*	57 *1*	3201.9	9/2$^+$	M1(+E2)	−0.02 *2*	A_2=−0.33 *1*, A_4=0.00 *1*, pol=−0.24 *6*.
		3369.8 *7*	43 *1*	0	7/2$^-$	M2+E3	+0.94 *+10−5*	A_2=+0.95 *1*, A_4=+0.51 *1*, A_6=+0.16 *1*, pol=−0.79 *11*.
3400.2	1/2$^+$	1390.0‡ *3*	100	2010.2	3/2$^+$	M1+E2		A_2=0.00 *3*, A_4=−0.01 *3*, pol=+0.02 *15*.
3495.2	5/2$^+$	444.8 *4*	12& *3*	3050.2	3/2$^+$			
		1485.2 *4*	83& *6*	2010.2	3/2$^+$	M1+E2	−0.14 *4*	A_2=−0.10 *5*, A_4=+0.02 *6*, pol=−0.97 *10*.
3527.5	3/2$^+$	1584.5 *8*	100	1943.0	3/2$^-$	D+Q		Mult.: 1980Li10 give M1+E2, but that is in conflict with adopted J^π. A_2=−0.34 *5*, A_4=+0.14 *6*, pol=−0.14 *34*.
3614.1	1/2$^-$	1151.4 *4*	33[a] *4*	2462.6	3/2$^-$			
3614.4	7/2$^+$	3614.2 *8*	100	0	7/2$^-$	E1+M2	+0.06 *5*	A_2=+0.46 *1*, A_4=−0.02 *1*, pol=−1.04 *17*.
3677.0	9/2$^-$	717.7 *4*	5.7 *6*	2959.3	7/2$^-$	M1+E2	−0.19 *+5−9*	A_2=−0.17 *5*, A_4=+0.49 *26*, pol=−0.33 *13*.
		3676.8 *8*	94.3 *6*	0	7/2$^-$	M1+E2	−1.28 *2*	A_2=−1.06 *1*, A_4=+0.34 *1*, pol=+0.32 *8*.
3730.9	3/2$^-$	1268.4 *3*	32.6 *10*	2462.6	3/2$^-$	M1+E2		δ: +0.32 *6* for J=5/2, unknown for J=3/2. A_2=+0.18 *7*, A_4=+0.01 *7*.
		1787.6 *5*	18.1 *12*	1943.0	3/2$^-$	M1+E2		A_2=−0.48 *15*, A_4=−0.20 *17*. δ: −0.27 *13* for J=5/2; unknown for J=3/2.
		3730.4 *8*	49.3 *11*	0	7/2$^-$	(E2)		δ: 0.00 *3* for J=5/2; pure E2 for J=3/2. Mult=E2 required by ΔJ^π. A_2=−0.11 *33*, A_4=+0.2 *4*, pol=+0.29 *51*.
3740.7	(3/2,5/2)$^+$	1730.5 *4*	100	2010.2	3/2$^+$	M1(+E2)	<0.4	δ: −0.3 *1* for J=5/2; 0.0 *2* for J=3/2.

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^{38}Ar(α,nγ) 1980Li10,1977Li07,1976Li17 (continued)

$\gamma(^{41}Ca)$ (continued)

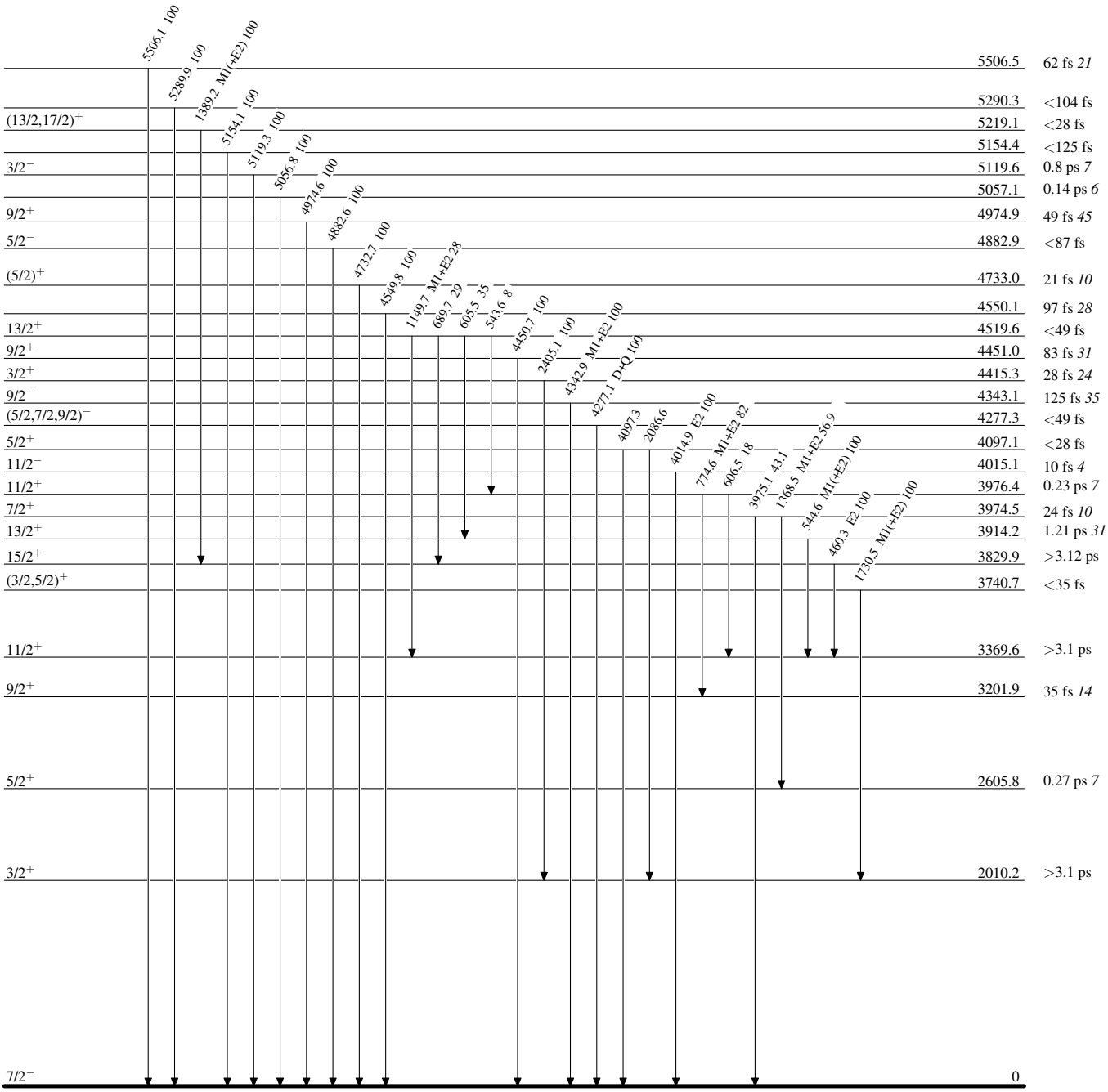
E_i(level)	J_i^π	E_γ[†]	I_γ[#]	E_f	J_f^π	Mult.[@]	δ[@]	Comments
								A_2=+0.15 *5*, A_4=+0.05 *5*, pol=+0.29 *1*.
3829.9	15/2$^+$	460.3 *2*	100	3369.6	11/2$^+$	E2		A_2=+0.35 *1*, A_4=−0.19 *2*, pol=+0.60 *11*.
3914.2	13/2$^+$	544.6 *4*	100	3369.6	11/2$^+$	M1(+E2)	−0.01 *3*	A_2=−0.26 *2*, A_4=−0.02 *3*, pol=−0.40 *3*.
3974.5	7/2$^+$	1368.5[‡] *4*	56.9 *13*	2605.8	5/2$^+$	M1+E2	+0.06 *3*	A_2=−0.21 *3*, A_4=−0.02 *3*, pol=−0.63 *16*.
		3975.1[‡] *8*	43.1 *13*	0	7/2$^-$			
3976.4	11/2$^+$	606.5[‡] *5*	18 *8*	3369.6	11/2$^+$			
		774.6 *2*	82 *8*	3201.9	9/2$^+$	M1+E2	−0.09 *2*	A_2=−0.13 *2*, A_4=−0.01 *2*, pol=−0.43 *3*.
4015.1	11/2$^-$	4014.9 *8*	100	0	7/2$^-$	E2		A_2=+0.42 *2*, A_4=−0.19 *2*, pol=+0.85 *27*.
4097.1	5/2$^+$	2086.6 *8*		2010.2	3/2$^+$			
		4097.3 *10*		0	7/2$^-$			
4277.3	(5/2,7/2,9/2)$^-$	4277.1 *10*	100	0	7/2$^-$	D+Q		A_2=−0.20 *3*, A_4=−0.09 *5*, pol=+0.32 *45*.
4343.1	9/2$^-$	4342.9 *10*	100	0	7/2$^-$	M1+E2	+7.3 *+12−9*	A_2=+0.25 *2*, A_4=+0.34 *2*, pol=+0.25 *31*.
4415.3	3/2$^+$	2405.1 *6*	100	2010.2	3/2$^+$			
4451.0	9/2$^+$	4450.7 *10*	100	0	7/2$^-$			A_2=−0.28 *3*, A_4=−0.01 *3*, pol=−0.21 *45*.
4519.6	13/2$^+$	543.6[‡] *4*	8 *2*	3976.4	11/2$^+$			
		605.5 *4*	35 *4*	3914.2	13/2$^+$			
		689.7 *3*	29 *3*	3829.9	15/2$^+$			
		1149.7 *3*	28 *3*	3369.6	11/2$^+$	M1+E2	−0.04 *2*	A_2=−0.38 *3*, A_4=0.00 *4*, pol=−0.34 *11*.
4550.1		4549.8 *10*	100	0	7/2$^-$			
4733.0	(5/2)$^+$	4732.7 *11*	100	0	7/2$^-$			A_2=−0.18 *2*, A_4=+0.05 *3*.
4882.9	5/2$^-$	4882.6 *11*	100	0	7/2$^-$			
4974.9	9/2$^+$	4974.6 *11*	100	0	7/2$^-$			A_2=−0.24 *3*, A_4=+0.02 *4*.
5057.1		5056.8 *14*	100	0	7/2$^-$			
5119.6	3/2$^-$	5119.3 *15*	100	0	7/2$^-$			
5154.4		5154.1 *16*	100	0	7/2$^-$			
5219.1	(13/2,17/2)$^+$	1389.2 *8*	100	3829.9	15/2$^+$	M1(+E2)	<0.04	δ: 0.00 *2* for J=17/2, +0.01 *3* for J=13/2. A_2=−0.20 *3*, A_4=0.00 *3*, pol=−0.30 *14*.
5290.3		5289.9 *13*	100	0	7/2$^-$			
5506.5		5506.1 *16*	100	0	7/2$^-$			

[†] From 1976Li17, unless otherwise stated.
[‡] From 1980Li10.
[#] From 1980Li10, unless otherwise stated.
[@] From $\gamma(\theta)$ and γ(lin pol) data (1980Li10,1977Li09), combined with RUL.
[&] From (d,pγ) (1974Mc01) since 444 γ and 445γ form an unresolved doublet in (α,nγ).
[a] From (d,pγ) (1975Ta13).

^{38}Ar(α,nγ) 1980Li10,1977Li07,1976Li17

Level Scheme

Intensities: % photon branching from each level

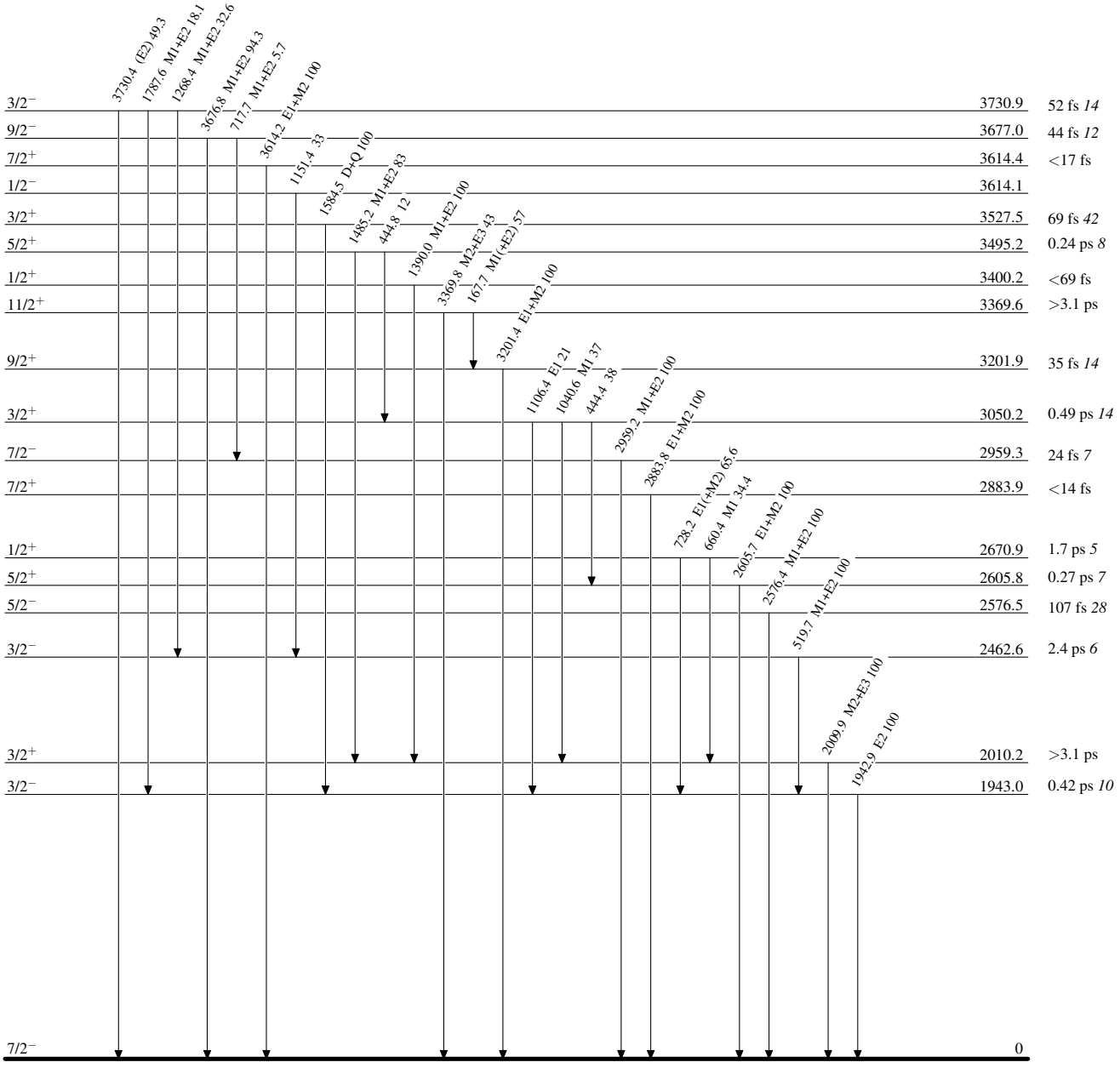


$^{41}_{20}Ca_{21}$

^{38}Ar(α,nγ) 1980Li10,1977Li07,1976Li17

Level Scheme (continued)

Intensities: % photon branching from each level



$^{41}_{20}Ca_{21}$