^{36}S(α,γ):resonances 1988Cs02,1986Jo09

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 140, 1 (2017)	30-Sep-2015

Includes ^{36}S(α,α): Resonances from 1994An39.

1988Cs02, 1986Jo09: E=2.35-3.50 MeV alpha beams were produced from the 5 MV Van de Graaff accelerator of the Institute of Nuclear Research in Debrecen. Target was prepared by implanting a 15 μg/cm^2 or a 32 μg/cm^2 ^{36}S ions into a 0.4 mm thick Ta backing. γ rays were detected with a HARSHAW 105 cm^3 Ge(Li) detector (FWHM=4.5 keV at 2.61 MeV). Measured σ(Eα), γ yields, $\gamma(\theta)$ Doppler-shift attenuation. Deduced levels, J, π, $T_{1/2}$.

1994An39: ^{36}S(α,α) E=12.56-15 MeV. Measured $\sigma(\theta)$. Deduced resonances in ^{40}Ar at Eα=13320 (J^π=7$^-$) and Eα=14120 (J^π=8$^+$).

All data are from 1988Cs02 and also 1986Jo09.

^{40}Ar Levels

E(level)†	J$^\pi$‡	T or Γ#	Eα(Lab)&	(2J+1)Γ$_\alpha$Γ$_\gamma$/Γ (eV)@	Comments
0	0$^+$				
1461	2$^+$				
2121	0$^+$				
2524	2$^+$	0.50 ps *8*			
2893	4$^+$				
3208	2$^+$	62 fs *12*			
3511	2$^+$	62 fs *12*			
3681	3$^-$				
3919	2$^+$				
4041					
4082	3$^-$				
4301	(1,3)$^-$				
4324	2$^+$	15 fs *6*			
4473	1				
4602		73 fs *12*			
8919 *3*	1$^-$		2353	0.10 *5*	Γ$_\alpha$/Γ$_\gamma$≤0.11, Γ$_\gamma$≥0.33 eV (1988Cs02).
9127 *3*	1$^-$	0.72 eV *16*	2584	0.18 *3*	Γ$_\alpha$/Γ$_\gamma$=0.10 2, Γ$_\alpha$=0.07 eV *2*, Γ$_\gamma$=0.65 eV *16*, Γ$_{\gamma0}$=0.65 eV *17* (1988Cs02).
9138 *6*	(1$^-$,2$^+$)		2597	0.2 *1*	
9147 *5*	1$^-$		2607	0.2 *1*	
9178 *3*	1$^-$		2641	0.2 *1*	
9197 *6*	(1$^-$,2$^+$)		2662	0.2 *1*	
9216 *4*	1$^-$		2683	0.030 *15*	
9234 *4*	1$^-$		2703	0.30 *15*	
9240 *6*	1$^-$		2710	0.10 *5*	
9264 *4*	(1$^-$,2$^+$)		2737	0.10 *5*	
9273 *6*	1$^-$		2747	0.030 *15*	
9287 *4*			2762	0.30 *15*	
9296 *5*	(1$^-$,2$^+$)		2772	0.30 *15*	
9314 *4*	(1$^-$,2$^+$)		2792	0.10 *5*	
9330 *4*	1$^-$		2810	0.10 *5*	
9339 *4*	1$^-$		2820	0.30 *15*	
9355 *3*	1$^-$	1.1 eV *3*	2838	0.8 *1*	Γ$_\alpha$/Γ$_\gamma$=0.63 *17*, Γ$_\alpha$=0.43 eV *21*, Γ$_\gamma$=0.69 eV *23*, Γ$_{\gamma0}$=0.60 eV *21* (1988Cs02).
9373 *4*			2858	0.30 *15*	
9413 *5*	1$^-$	4.0 eV *20*			E(level): for unresolved 9408+9417 doublet, with Eα=2897 *4* and 2907 *4*, and (2J+1)Γ$_\alpha$Γ$_\gamma$/Γ=0.5 eV *1* and 0.8 eV *1*, respectively. Γ$_\alpha$/Γ$_\gamma$=0.07 *3*, Γ$_\alpha$=0.10 eV *5*, Γ$_\gamma$=3.9 eV *20*,

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^{36}S(α,γ):resonances 1988Cs02,1986Jo09 (continued)

^{40}Ar Levels (continued)

E(level)[†]	Jπ[‡]	T or Γ[#]	Eα(Lab)[&]	(2J+1)$\Gamma_\alpha\Gamma_\gamma/\Gamma$ (eV)[@]	Comments
					$\Gamma_{\gamma0}$=1.4 eV *7* (1988Cs02).
9425 *5*	(1^-,2^+)		2916	0.10 *5*	
9433 *5*	(1^-,2^+)		2925	0.4 *2*	
9450 *3*	1^-		2943	0.9 *2*	
9472 *4*	(1^-,2^+)		2968	0.10 *5*	
9485 *5*	1^-		2982	0.2 *1*	
9491?			2989		
9504.2 *14*	1^-	8.2 eV *18*	3004.4	3.3 *4*	$\Gamma_\alpha/\Gamma_\gamma$=0.19 *4*, Γ_α=1.3 eV *5*, Γ_γ=6.9 eV *17*, $\Gamma_{\gamma0}$=6.2 eV *16* (1988Cs02).
9527 *4*			3029	0.7 *3*	
9565 *4*	1^-		3071	0.30 *15*	
9582 *3*					E(level): for unresolved 9581+9586 doublet, with Eα=3089 *3* and 3095 *7*, and (2J+1)$\Gamma_\alpha\Gamma_\gamma/\Gamma$=4.6 eV *7* and 0.9 eV *4*, respectively. Jπ: 1^- for Eα=3089 component and (1^-,2^+) for Eα=3095 component.
9596 *4*			3106	0.6 *3*	
9608 *5*			3119	0.6 *3*	
9618 *3*	1^-		3130	2.5 *4*	
9656 *4*	1^-		3172	0.30 *15*	
9669 *4*	1^-		3187	0.6 *3*	
9689 *3*	(1^-,2^+)				E(level): for unresolved 9687+9694 doublet, with Eα=3207 *3* and 3215 *5*, and (2J+1)$\Gamma_\alpha\Gamma_\gamma/\Gamma$=2.4 eV *7* and 1.5 eV *8*, respectively.
9736 *3*	1^-		3262	1.3 *2*	
9759 *4*	(1^-,2^+)		3287	0.10 *5*	$\Gamma_\alpha/\Gamma_\gamma\leq$0.07, $\Gamma_\gamma\geq$0.53 eV.
9769 *4*	(1^-,2^+)		3298	0.10 *5*	
9787 *4*	1^-		3318	0.8 *4*	
9813 *3*	1^-		3347	1.5 *8*	
9825 *3*	1^-		3360	1.9 *2*	
9850 *3*	1^-	22 eV *6*			E(level): for unresolved 9849+9852 doublet, with Eα=3387 *3* and 3391 *5*, and (2J+1)$\Gamma_\alpha\Gamma_\gamma/\Gamma$=1.9 eV *2* and 0.7 eV *3*, respectively. $\Gamma_\alpha/\Gamma_\gamma$=0.03 *1*, Γ_α=0.65 eV *29*, Γ_γ=22 eV *6*, $\Gamma_{\gamma0}$=10 eV *3* (1988Cs02).
9866 *4*			3406	0.2 *1*	
9881 *4*	1^-		3423	0.10 *5*	
9893 *4*	1^-		3436	0.2 *1*	
9912 *5*	(1^-,2^+)		3457	0.2 *1*	
9944 *3*	1^-		3493	2.8 *4*	
9954 *3*	1^-	≥9.6 eV	3503	5.5 *7*	$\Gamma_\alpha/\Gamma_\gamma$=2.9 *10*, $\Gamma_\alpha\geq$7.1 eV, $\Gamma_\gamma\geq$2.5 eV, $\Gamma_{\gamma0}\geq$1.7 eV (1988Cs02).

[†] Rounded values from Adopted Levels up to 4602. The excitation energies of resonances (levels above E=4602) are deduced from Eα(lab). Excitation energy=Eα(c.m.)+S(α)(^{40}Ar), with S(α)=6800.69 *19* (2012Wa38).

[‡] Assignments above 8 MeV are based on measured γ(θ) and natural parity for resonant levels excited by (α,γ) (1988Cs02); below this energy the assignments are from Adopted Levels.

[#] From 1988Cs02. Half-life was measured by DSAM.

[@] From 1986Jo09 (also in 1988Cs02).

[&] From 1986Jo09 (also in 1988Cs02), uncertainty is the same as given for the excitation energy.

^{36}S(α,γ):resonances 1988Cs02,1986Jo09 (continued)

$\gamma(^{40}Ar)$

E_i(level)	J_i^π	E_γ[†]	I_γ[‡]	E_f	J_f^π
1461	2^+	1461		0	0^+
2121	0^+	660		1461	2^+
2524	2^+	1063		1461	2^+
		2524		0	0^+
2893	4^+	1432		1461	2^+
3208	2^+	1747		1461	2^+
3511	2^+	2051		1461	2^+
3681	3^-	2220		1461	2^+
3919	2^+	3919		0	0^+
4041		1517	63[b] *10*	2524	2^+
		2580	37[b] *10*	1461	2^+
4082	3^-	2622		1461	2^+
4301	$(1,3)^-$	2840		1461	2^+
4324	2^+	2864	30 *6*	1461	2^+
		4324	70 *6*	0	0^+
4473	1	4473		0	0^+
4602		2078		2524	2^+
9127	1^-	9127	100	0	0^+
9355	1^-	4882[cd]		4473	1
		5054	6	4301	$(1,3)^-$
		5436	7	3919	2^+
		9354	87	0	0^+
9413	1^-	5331[a]	19[a]	4082	3^-
		5494[a]	14[a]	3919	2^+
		5902[a]	18[a]	3511	2^+
		6888[a]	3[a]	2524	2^+
		7951[a]	11[a]	1461	2^+
		9412[a]	35[a]	0	0^+
9450	1^-	5939	8	3511	2^+
		6242	8	3208	2^+
		6556[d]	4	2893	4^+
		6925	13	2524	2^+
		7328	12	2121	0^+
		7988	35	1461	2^+
		9449	24	0	0^+
9504.2	1^-	5585	3	3919	2^+
		7383	2	2121	0^+
		8042	6	1461	2^+
		9503	89	0	0^+
9582		5663[&]	5[&]	3919	2^+
		6688[&d]	5[&]	2893	4^+
		7057[&]	11[&]	2524	2^+
		7460[&]	25[&]	2121	0^+
		8120[&]	18[&]	1461	2^+
		9581[&]	41[&]	0	0^+
9618	1^-	5699	5	3919	2^+
		5937	2	3681	3^-
9618	1^-	6107	2	3511	2^+
		6409	4	3208	2^+
		6724[d]	3	2893	4^+
		7093	7	2524	2^+
		7496	3	2121	0^+
		8156	46	1461	2^+
		9617	31	0	0^+
9689	$(1^-,2^+)$	5087[@]	14[@]	4602	
		5365[@]	8[@]	4324	2^+
		5770[@]	6[@]	3919	2^+
		6178[@]	6[@]	3511	2^+
		6480[@]	5[@]	3208	2^+
		7164[@]	54[@]	2524	2^+
		8227[@]	4[@]	1461	2^+
		9688[@]	3[@]	0	0^+
9736	1^-	5134	5	4602	
		5817	13	3919	2^+
		6527	11	3208	2^+
		7211	5	2524	2^+
		7614	7	2121	0^+
		8274	11	1461	2^+
		9735	48	0	0^+
9825	1^-	5906	10	3919	2^+
		6144	9	3681	3^-
		6314	2	3511	2^+
		6616	13	3208	2^+
		7300	17	2524	2^+
		7703	7	2121	0^+
		8363	25	1461	2^+
		9824	17	0	0^+
9850	1^-	6956[#d]	9[#]	2893	4^+
		7325[#]	28[#]	2524	2^+
		8388[#]	25[#]	1461	2^+
		9849[#]	47[#]	0	0^+
9944	1^-	5471[d]	4	4473	1
		6025	5	3919	2^+
		7419	23	2524	2^+
		7822	9	2121	0^+
		8482	25	1461	2^+
		9943	38	0	0^+
9954	1^-	5630	4	4324	2^+
		5913	2	4041	
		6035	2	3919	2^+
		7429	9	2524	2^+
		8492	12	1461	2^+
		9953	71	0	0^+

[†] Values are not given in 1988Cs02 and 1986Jo09. The evaluator has taken level-energy differences based on decay scheme in 1986Jo09. For levels below 4602, energies are rounded values from Adopted Gammas.

[‡] Quoted values are % branching from each level from 1986Jo09.

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^{36}S(α,γ):resonances 1988Cs02,1986Jo09 (continued)

$\gamma(^{40}Ar)$ (continued)

[#] γ decays from 9849 and 9852 are unresolved. Quoted Eγ corresponds to the average deduced from the decay of two levels.
[@] γ decays from 9687 and 9694 are unresolved. Quoted Eγ corresponds to the average deduced from the decay of two levels.
[&] γ decays from 9581 and 9586 are unresolved. Quoted Eγ corresponds to the average deduced from the decay of two levels.
[a] γ decays from 9408 and 9417 are unresolved. Quoted Eγ corresponds to the average deduced from the decay of two levels.
[b] Measured at 3503 resonance.
[c] Weak γ ray. 1986Jo09 state that it could be a transition to the 4473 or 4481 levels.
[d] Placement of transition in the level scheme is uncertain.

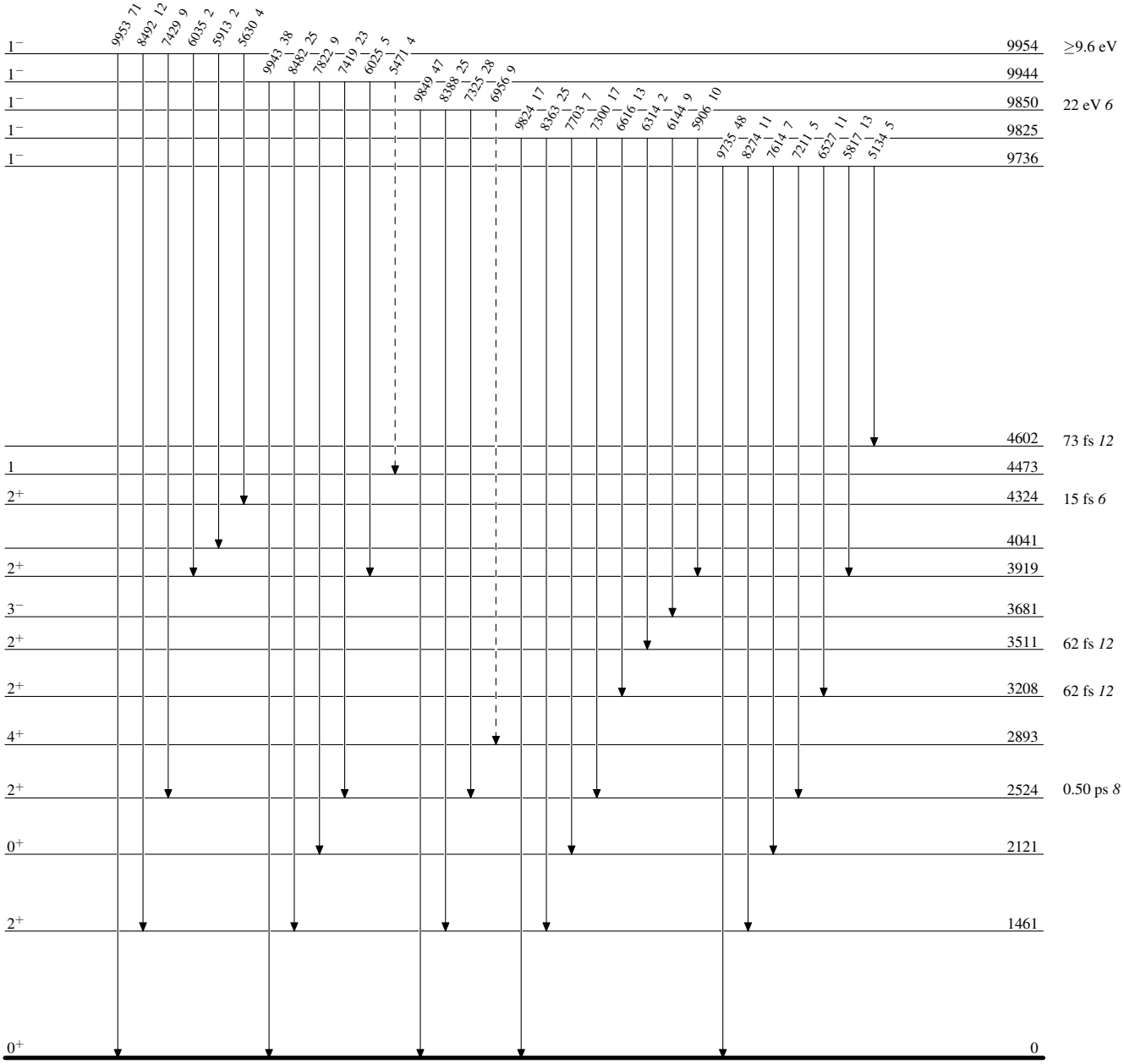
^{36}S(α,γ):resonances 1988Cs02,1986Jo09

Legend

Level Scheme

Intensities: % photon branching from each level

γ Decay (Uncertain)



$^{40}_{18}Ar_{22}$

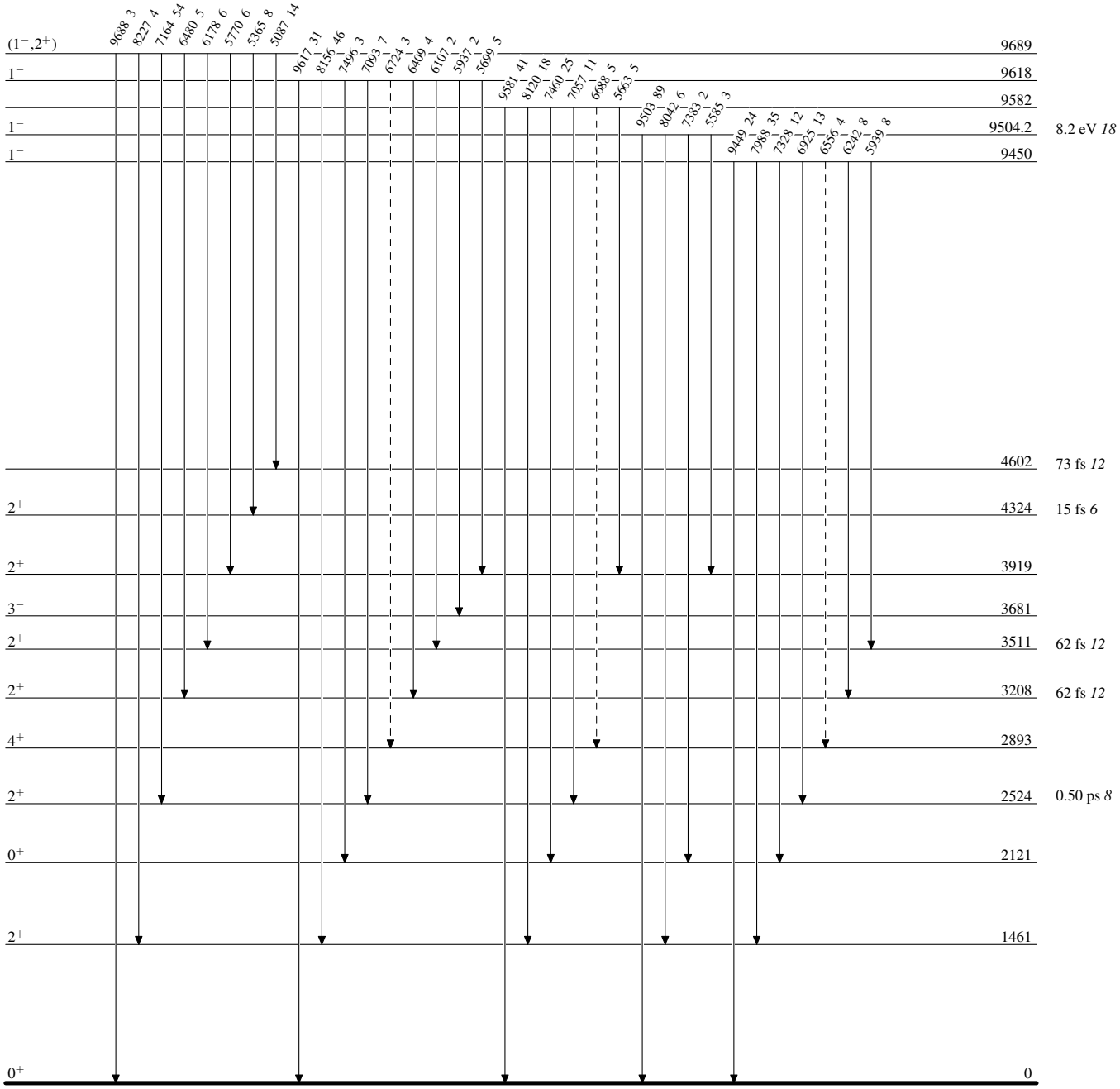
^{36}S(α,γ):resonances 1988Cs02,1986Jo09

Legend

Level Scheme (continued)

Intensities: % photon branching from each level

- - - - - - ► γ Decay (Uncertain)



$^{40}_{18}Ar_{22}$

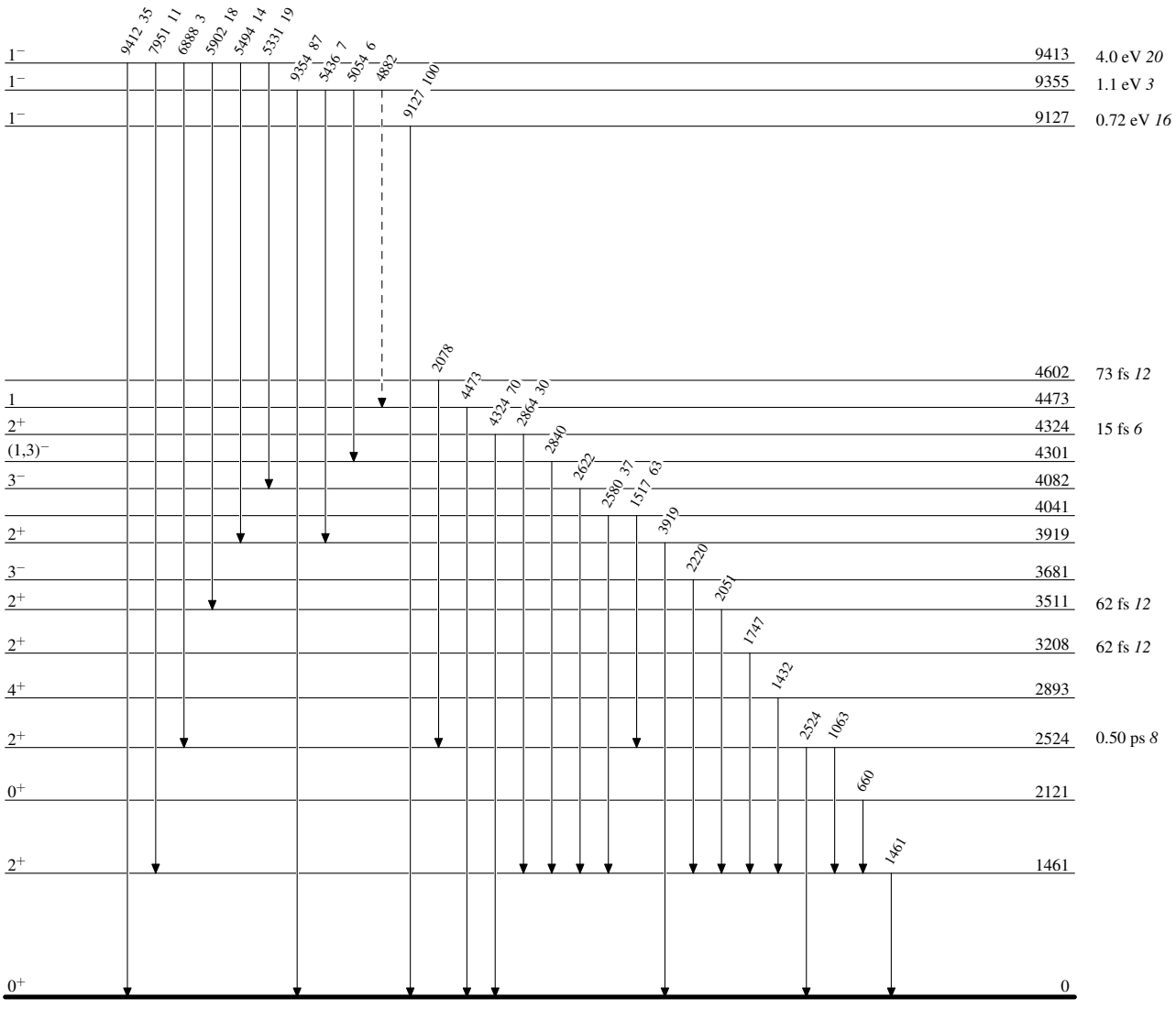
^{36}S(α,γ):resonances 1988Cs02,1986Jo09

Legend

Level Scheme (continued)

Intensities: % photon branching from each level

γ Decay (Uncertain)



$^{40}_{18}Ar_{22}$