

$^{27}\text{Al}(\text{d},\text{p}\gamma)$ 1975Fr11,1970Fr10,1977El04

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	M. Shamsuzzoha Basunia		NDS 114, 1189 (2013)	1-Apr-2013

Others: 1972Ma14, 1971Bo36.

1975Fr11: Aluminum target 30 $\mu\text{g}/\text{cm}^2$ thickness self-supporting or on, a silver backing, $E=3.14$ MeV, protons were detected by annular Si detector and γ ray by Ge(Li) detector, measured $E\gamma$, $I\gamma$, P- γ coin; deduced excitation energy, level scheme, and mean lifetime by Doppler Shift Attenuation method.

1970Fr10: Projectile energy $E=3.5$ MeV; protons were detected by semiconductor detector and γ ray by Ge(Li) detector; measured $E\gamma$, $I\gamma$, P- γ coin; deduced excitation energy and level scheme.

1977El04: Aluminum target 45 $\mu\text{g}/\text{cm}^2$ onto 400 $\mu\text{g}/\text{cm}^2$ gold backings; measured $E\gamma$, $I\gamma$, P- γ coin; deduced excitation energy, level scheme, J^π , and mean lifetime by Doppler Shift Attenuation method.

 ^{28}Al Levels

E(level) [†]	J^π [†]	$T_{1/2}$ [‡]	Comments
0.0	3 ⁺		
30.6382 7	2 ⁺		
972.35 3	0 ⁺		
1013.637 9	3 ⁺	132 fs 21	$T_{1/2}$: Other: 90 fs 14 (1972Ma14).
1372.917 20	1 ⁺	223 fs 35	$T_{1/2}$: Weighted average of 208 fs 42 (1972Ma14) and 256 fs 62 (1977El04).
1620.30 4	1 ⁺	92 fs 22	$T_{1/2}$: Weighted average of 125 fs 28 (1972Ma14) and 42 fs 35 (1977El04).
1622.907 20	2 ⁺	139 fs 28	$T_{1/2}$: Other: 49 fs 14 (1972Ma14).
2138.910 10	2 ⁺	56 fs 14	$T_{1/2}$: Other: <10.4 fs (1972Ma14).
2201.43 3	1 ⁺	83 fs 49	$T_{1/2}$: Other: 24 fs 7 (1972Ma14).
2271.745 19	4 ⁺	42 fs 14	$T_{1/2}$: Other: 10 fs 6 (1972Ma14).
2486.20 6	2 ⁺	76 fs 28	$T_{1/2}$: Other: 69 fs 21 (1972Ma14).
2581.81 22	5 ⁺	416 fs 69	$T_{1/2}$: Others: 381 fs 69 (1972Ma14), 284 fs 49 (1975Fr11).
2656.30 4	4 ⁺	49 fs 21	$T_{1/2}$: Other: 21 fs 8 (1972Ma14).
2987.94 12	(3,1) ⁺	62 fs 55	
3105 1	1 ⁺		
3296.34 4	(3 ⁺)	97 fs 21	
3347.19 4	2 ⁺	97 fs 35	
3465.294 10	4 ⁻	62 fs 8	
3591.457 9	(3 ⁻)	69 fs 14	
3670.69 7	3 ⁺	132 fs 42	
3709.222 16	(2,3) ⁺	187 fs 21	
3875.773 11	2 ⁻	55 fs 14	
3901.00 4	(1,3) ⁺	187 fs 28	
3935.603 18	2 ⁺	<42 fs	
4033 2	5 ⁻	108 fs 43	$T_{1/2}$: From 152 fs 21 (1977El04) and 65 fs 14 (1975Fr11) using the Limitation of Relative Statistical Weight method (1985ZiZY).
4244.49 10	2 ⁺	42 fs 21	
4596.56 4	3 ⁺	159 fs 83	
4691.097 6	3 ⁻	35 fs 9	
4764.922 10	2 ⁻	35 fs 9	
4903.577 6	2 ⁻	39 fs 6	
5134.849 8	3 ⁻	28 fs 7	
5165 2	6 ⁻ , (4 ⁻ , 5 ⁻)	<49 fs	$T_{1/2}$: From 1975Fr11.
5442.267 8		21 fs 7	
6004.8 4		<35 ns	$T_{1/2}$: From 1972Ma14.

[†] From Adopted Levels.

[‡] From 1977El04, except otherwise noted. Values reported in 1972Ma14 are listed as comments. Mean lifetime are deduced by the Doppler Attenuation Method. Evaluator deduced the half-life from reported mean lifetimes.

$^{27}\text{Al}(\text{d},\text{p}\gamma)$ **1975Fr11,1970Fr10,1977E104 (continued)**

$\gamma(^{28}\text{Al})$								
$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\ddagger$	E_f	J_f^π	Mult.&	δ^a	Comments
30.6382	2 ⁺	30.6382 7	100	0.0	3 ⁺	M1+E2	-0.03 5	
972.35	0 ⁺	941.79 6	100	30.6382	2 ⁺			
		972.31	<0.9	0.0	3 ⁺			E_γ : not adopted, γ ray transition from 0 ⁺ to 3 ⁺ .
1013.637	3 ⁺	41.29	<0.7	972.35	0 ⁺			E_γ : not adopted, γ ray transition from 3 ⁺ to 0 ⁺ .
		983.018 16	62.8 7	30.6382	2 ⁺	M1+E2	+0.13 5	
		1013.676 21	37.2 7	0.0	3 ⁺			
1372.917	1 ⁺	359.28	<0.5	1013.637	3 ⁺			
		400.58 3	40.0 5	972.35	0 ⁺			
		1342.30 11	55.3 5	30.6382	2 ⁺	M1+E2	-0.25 12	
		1372.8 2	4.7 3	0.0	3 ⁺			
1620.30	1 ⁺	247.38	<2	1372.917	1 ⁺			
		606.65	<2	1013.637	3 ⁺			
		647.93 7	<1.5	972.35	0 ⁺			
		1589.72 8	>80	30.6382	2 ⁺	M1+E2	+0.18 9	
		1620.0 4	<20	0.0	3 ⁺			
1622.907	2 ⁺	249.99	<3	1372.917	1 ⁺			
		609.26	<2	1013.637	3 ⁺			
		650.54	<1.5	972.35	0 ⁺			
		1592.29 12	<24	30.6382	2 ⁺			
		1622.87 6	100@	0.0	3 ⁺			
2138.910	2 ⁺	515.99 5	<3@	1622.907	2 ⁺			
		518.60 6	<2@	1620.30	1 ⁺			
		765.97 5	<1@	1372.917	1 ⁺			
		1125.54 21	7@ 2	1013.637	3 ⁺			
		1166.51 5	<2@	972.35	0 ⁺			
		2108.24 4	50@ 4	30.6382	2 ⁺			
		2138.828 18	43@ 4	0.0	3 ⁺			
2201.43	1 ⁺	62.52	<3.5	2138.910	2 ⁺			
		578.51	5 3	1622.907	2 ⁺			
		581.12	<2.5	1620.30	1 ⁺			
		828.49	<2.5	1372.917	1 ⁺			
		1187.74	<4.5	1013.637	3 ⁺			
		1229.8 4	16 2	972.35	0 ⁺			
		2170.70 3	79 3	30.6382	2 ⁺			
		2201.25	<6	0.0	3 ⁺			
2271.745	4 ⁺	132.83	<5	2138.910	2 ⁺			
		648.82	<5	1622.907	2 ⁺			
		651.43	<3	1620.30	1 ⁺			E_γ : not adopted, γ ray transition from 4 ⁺ to 1 ⁺ .
		898.80	<2.5	1372.917	1 ⁺			E_γ : not adopted, γ ray transition from 4 ⁺ to 1 ⁺ .
		1258.05	<4	1013.637	3 ⁺			
		1299.33	<2.5	972.35	0 ⁺			E_γ : Not adopted. γ ray transition from 4 ⁺ to 0 ⁺ .
		2240.92	<2.5	30.6382	2 ⁺			
		2271.650 23	100 5	0.0	3 ⁺			
2486.20	2 ⁺	214.45	<1	2271.745	4 ⁺			
		347.29	<1	2138.910	2 ⁺			
		863.26	11 3	1622.907	2 ⁺			
		865.87 15	61 4	1620.30	1 ⁺			
		1113.24	<2	1372.917	1 ⁺			

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$^{27}\text{Al}(\text{d},\text{p}\gamma)$ **1975Fr11,1970Fr10,1977El04 (continued)** $\gamma(^{28}\text{Al})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\ddagger$	E_f	J_f^π	Comments
2486.20	2 ⁺	1472.48	<2	1013.637	3 ⁺	
		1513.76	6 2	972.35	0 ⁺	
		2455.8 3	<6	30.6382	2 ⁺	
		2486.09 7	22 4	0.0	3 ⁺	
2581.81	5 ⁺	310.2	5 [#] 2	2271.745	4 ⁺	
		442.89	<1 [#]	2138.910	2 ⁺	E_γ : not adopted, γ ray transition from 5 ⁺ to 2 ⁺ .
		958.87	<5 [#]	1622.907	2 ⁺	E_γ : not adopted, γ ray transition from 5 ⁺ to 2 ⁺ .
		961.47	<4 [#]	1620.30	1 ⁺	E_γ : not adopted, γ ray transition from 5 ⁺ to 1 ⁺ .
		1208.84	<4 [#]	1372.917	1 ⁺	E_γ : not adopted, γ ray transition from 5 ⁺ to 1 ⁺ .
		1568.08	<5 [#]	1013.637	3 ⁺	
		1609.36	<4 [#]	972.35	0 ⁺	E_γ : not adopted, γ ray transition from 5 ⁺ to 0 ⁺ .
		2550.92	<4 [#]	30.6382	2 ⁺	E_γ : not adopted, γ ray transition from 5 ⁺ to 2 ⁺ .
		2582.2 5	95 2	0.0	3 ⁺	
2656.30	4 ⁺	384.55	<1	2271.745	4 ⁺	
		454.86	<1	2201.43	1 ⁺	E_γ : not adopted, γ ray transition from 4 ⁺ to 1 ⁺ .
		517.38	<1	2138.910	2 ⁺	
		1033.35	<3	1622.907	2 ⁺	
		1035.96	<3	1620.30	1 ⁺	E_γ : not adopted, γ ray transition from 4 ⁺ to 1 ⁺ .
		1283.54 7	<3	1372.917	1 ⁺	E_γ : not adopted, γ ray transition from 4 ⁺ to 1 ⁺ .
		1642.35 10	75 4	1013.637	3 ⁺	
		1683.84	<3	972.35	0 ⁺	E_γ : Transition from 4 ⁺ to 0 ⁺ – not adopted.
		2625.40	<4	30.6382	2 ⁺	
		2656.34 7	25 [@] 4	0.0	3 ⁺	
3105	1 ⁺	3074	100 [@]	30.6382	2 ⁺	
3296.34	(3 ⁺)	1157.38	10 [@] 5	2138.910	2 ⁺	
		1673.43 11	33 [@] 10	1622.907	2 ⁺	
		3265.49 4	44 [@] 10	30.6382	2 ⁺	
3347.19	2 ⁺	3346.97 4	100 [@]	0.0	3 ⁺	
3465.294	4 ⁻	1193.64 10	7 [@] 3	2271.745	4 ⁺	
		3465.067 10	93 [@] 3	0.0	3 ⁺	
3591.457	(3 ⁻)	2577.725 21	27 [@] 5	1013.637	3 ⁺	
		3560.547 19	14 [@] 5	30.6382	2 ⁺	
		3591.211 11	56 [@] 7	0.0	3 ⁺	
3709.222	(2,3) ⁺	1437.40	22 [@] 5	2271.745	4 ⁺	
		1570.22	16 [@] 5	2138.910	2 ⁺	
		3678.15 5	24 [@] 5	30.6382	2 ⁺	
		3708.976 16	38 [@] 8	0.0	3 ⁺	
3875.773	2 ⁻	2255.42 5	18 [@] 8	1620.30	1 ⁺	
		3875.480 11	82 [@] 8	0.0	3 ⁺	
4033	5 ⁻	567	51 [#] 3	3465.294	4 ⁻	
		1761	49 [#] 3	2271.745	4 ⁺	
5165	6 ⁻ , (4 ⁻ , 5 ⁻)	1132	100	4033	5 ⁻	

[†] From Adopted Gammas. γ rays without uncertainty are calculated by the evaluator from level energy differences. Recoil energy has been subtracted.

[‡] From 1971Bo36, except otherwise noted.

$^{27}\text{Al}(\text{d},\text{p}\gamma)$ **1975Fr11,1970Fr10,1977E104 (continued)**

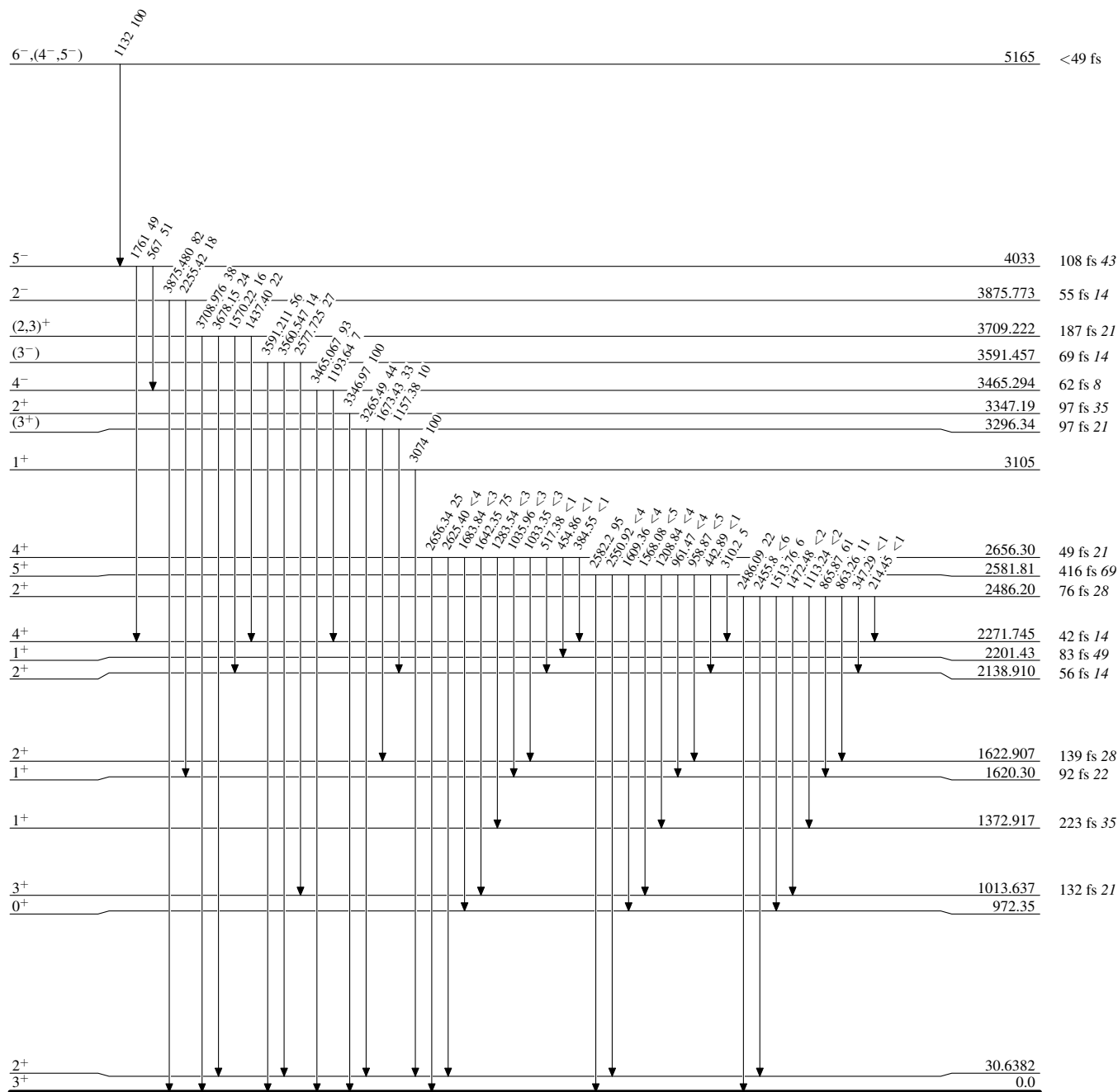
$\gamma(^{28}\text{Al})$ (continued)

From [1975Fr11](#).
@ From [1970Fr10](#).
& From Adopted Gammas.
^a From [1971Bo36](#).

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Level Scheme

Intensities: % photon branching from each level



²⁷Al(d,p)_γ 1975FF11,1970FF10,1977E104

Level Scheme (continued)

Intensities: % photon branching from each level

