

<sup>234</sup>U(t,α),(pol t,α) 1979FI02,1977Th04

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	B. Singh, J. K. Tuli, E. Browne		NDS 170, 499 (2020)	8-Oct-2020

1979FI02: (pol t,α): E(t)=17 MeV. FWHM=18-20 keV. Measured Eα, Iα at the Los Alamos Scientific Laboratory using FN Van de Graaff facility Measured σ(θ) and A<sub>y</sub>(θ) at θ=15°–60° in 10° steps with spin up and spin down runs at each angle, ΔE-E Si detector telescope. DWBA analysis.

1977Th04: (t,α): E(t)=15 MeV; FWHM=15-19 keV. Measured σ(θ) at 50°, 60° and 70° at the FN Van de Graaff facility of Los Alamos Scientific Laboratory. DWBA analysis.

Cross sections given under comments are mainly from 1979FI02 at 50°. For some levels, not reported by 1979FI02, the values are from 1977Th04 at 60°. Cross section data at 60° for all levels up to 1065 are available from 1977Th04.

<sup>233</sup>Pa Levels

E(level) <sup>‡</sup>	J <sup>π</sup> <sup>†</sup>	L <sup>@</sup>	S&	Comments
0 <sup>c</sup>	3/2 <sup>-a</sup>	1	0.043	dσ/dΩ=69 μb/sr. dσ/dΩ=79 μb/sr (1977Th04).
55 <sup>c</sup>	7/2 <sup>-a</sup>	3	0.061	E(level): 57 2 (1977Th04). dσ/dΩ=74 μb/sr. dσ/dΩ=80 μb/sr (1977Th04).
107 <sup>d</sup>	9/2 <sup>+</sup> &7/2 <sup>+</sup>	4	0.023	E(level): 104 6 (1977Th04). J <sup>π</sup> : L+1/2 from analyzing power A <sub>y</sub> (θ) (1979FI02). Unresolved doublet. S: for 9/2 <sup>+</sup> . dσ/dΩ=54 μb/sr. dσ/dΩ=58 μb/sr (1977Th04).
171 <sup>de</sup>	1/2 <sup>+</sup> &13/2 <sup>+</sup>	0+6	0.48	E(level): unresolved doublet, 169.2 and 173 in Adopted Levels. J <sup>π</sup> : 1/2 <sup>+</sup> from analyzing power A <sub>y</sub> (θ) (1979FI02). S: for the dominant 1/2 <sup>+</sup> component (1979FI02). dσ/dΩ=296 μb/sr for 171 unresolved doublet (169+173). dσ/dΩ=321 μb/sr for unresolved doublet (169+173) (1977Th04).
205 <sup>e</sup>	3/2 <sup>+</sup>	2	0.077	E(level): poorly resolved peak; 201.6 in Adopted Levels. J <sup>π</sup> : L-1/2 from analyzing power A <sub>y</sub> (θ) (1979FI02). dσ/dΩ=45 μb/sr. dσ/dΩ=54 μb/sr (1977Th04).
296 <sup>e</sup>	(5/2 <sup>+</sup> ,11/2 <sup>-</sup> ) <sup>a</sup>	2,5	0.008,0.01	E(level): 290 6 (1977Th04). dσ/dΩ=11 μb/sr. dσ/dΩ=8 μb/sr (1977Th04).
355	3/2 <sup>+</sup> <sup>a</sup>	2	0.38	E(level): 347 6 (1977Th04). dσ/dΩ=22 μb/sr. dσ/dΩ=19 μb/sr (1977Th04).
411 <sup>#</sup> 10				dσ/dΩ=3 μb/sr (1977Th04).
454 <sup>b</sup>	3/2 <sup>+</sup> <sup>a</sup>	2	0.26	E(level): 444 5 (1977Th04). dσ/dΩ=154 μb/sr. dσ/dΩ=143 μb/sr (1977Th04).
488 <sup>b</sup>	(5/2 <sup>+</sup> )		(0.02)	E(level): 474 10 (1977Th04). J <sup>π</sup> : 5/2 and 3/2[402] from 1977Th04. dσ/dΩ=27 μb/sr. dσ/dΩ=27 μb/sr (1977Th04).
523 <sup>#</sup> 10				dσ/dΩ=4 μb/sr (1977Th04).
555	11/2 <sup>+</sup> <sup>a</sup>	6	0.19	E(level): 543 10 (1977Th04). dσ/dΩ=26 μb/sr. dσ/dΩ=20 μb/sr (1977Th04).
586	7/2 <sup>+</sup> <sup>a</sup>	4	0.20	E(level): 569 10 (1977Th04). dσ/dΩ=41 μb/sr.

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<sup>234</sup>U(t,α),(pol t,α) **1979FI02,1977Th04 (continued)**

<sup>233</sup>Pa Levels (continued)

E(level) <sup>‡</sup>	J <sup>π</sup> <sup>†</sup>	L <sup>@</sup>	S <sup>&amp;</sup>	Comments
703	(3/2 <sup>-</sup> ) <sup>a</sup>	1	0.006	dσ/dΩ=36 μb/sr (1977Th04). E(level): 690 10 (1977Th04). dσ/dΩ=10 μb/sr.
742	(7/2 <sup>-</sup> ) <sup>a</sup>	3	0.004	dσ/dΩ=9 μb/sr (1977Th04). E(level): 736 8 (1977Th04). dσ/dΩ=5 μb/sr.
800 <sup>#</sup> 12				dσ/dΩ=21 μb/sr (1977Th04).
833 <sup>#</sup> 12				dσ/dΩ=2 μb/sr (1977Th04).
872	(3/2 <sup>-</sup> ) <sup>a</sup>	1	0.006	dσ/dΩ=5 μb/sr (1977Th04). E(level): 863 12 (1977Th04). dσ/dΩ=10 μb/sr.
942 <sup>#</sup> 12				dσ/dΩ=6 μb/sr (1977Th04).
998	9/2 <sup>+</sup> , (11/2 <sup>-</sup> ) <sup>a</sup>	4, (5)	0.033, 0.074	dσ/dΩ=7 μb/sr (1977Th04). E(level): 980 8 (1977Th04). 11/2 <sup>-</sup> , 9/2[514] assignment was suggested by 1977Th04.
1044 <sup>#</sup> 12				dσ/dΩ=85 μb/sr.
1073	5/2 <sup>+</sup> <sup>a</sup>	2	0.035	dσ/dΩ=74 μb/sr (1977Th04). dσ/dΩ=8 μb/sr (1977Th04). E(level): 1065 8 (1977Th04). 5/2 <sup>-</sup> , 1/2[541] assignment was suggested by 1977Th04.
1176	1/2 <sup>+</sup> <sup>a</sup>	0	0.057	dσ/dΩ=41 μb/sr.
1233	1/2 <sup>+</sup> , 3/2 <sup>-a</sup>	0, 1	0.031, 0.012	dσ/dΩ=38 μb/sr (1977Th04).
1267	1/2 <sup>+</sup> <sup>a</sup>	0	0.019	dσ/dΩ=35 μb/sr.
1308	1/2 <sup>+</sup> <sup>a</sup>	0	0.040	dσ/dΩ=19 μb/sr.
1386	5/2 <sup>+</sup> <sup>a</sup>	2	0.032	dσ/dΩ=12 μb/sr.
1417	5/2 <sup>+</sup> <sup>a</sup>	2	0.024	dσ/dΩ=25 μb/sr.
1486	5/2 <sup>+</sup> , 11/2 <sup>-a</sup>	2, 5	0.032, 0.052	dσ/dΩ=42 μb/sr.
1557				dσ/dΩ=32 μb/sr.
1625				dσ/dΩ=43 μb/sr.
1680				dσ/dΩ=28 μb/sr. dσ/dΩ=32 μb/sr. dσ/dΩ=18 μb/sr.

<sup>†</sup> Spin and Nilsson-orbital assignments by 1977Th04 were made from comparison of experimental cross sections with calculated ones. Assignments of 1979FI02 were based on analyzing powers.

<sup>‡</sup> From 1979FI02, unless otherwise stated. The uncertainties are not given by 1979FI02, these are estimated by the evaluators to be ≈5-10 keV from FWHM. Levels up to 1065 are reported by 1977Th04 but from 290 keV upwards, their energies seem to be systematically lower by 6-18 keV as compared to the values for corresponding groups in 1979FI02.

<sup>#</sup> Weak group reported only by 1977Th04.

<sup>@</sup> As implied by J<sup>π</sup> assignments from σ(θ) and A<sub>y</sub>(θ) data of 1979FI02 (evaluators).

<sup>&</sup> dσ/dΩ(expt)=23(S)dσ/dΩ(theory) (1979FI02).

<sup>a</sup> Assignment suggested by 1979FI02 from analyzing power measurement A<sub>y</sub>(θ) in (pol t,α).

<sup>b</sup> 3/2<sup>+</sup> and 5/2<sup>+</sup> members of π3/2[402] configuration.

<sup>c</sup> 3/2<sup>-</sup> and 7/2<sup>-</sup> members of π1/2[530] configuration.

<sup>d</sup> 7/2<sup>+</sup>, 9/2<sup>+</sup> and 13/2<sup>+</sup> members of π3/2[651] configuration.

<sup>e</sup> 1/2<sup>+</sup>, 3/2<sup>+</sup> and 5/2<sup>+</sup> members of π1/2[400] configuration.