^{99}Tc(p,d) 1977Em02,1976Sl06

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen, Balraj Singh	NDS 164, 1 (2020)	15-Feb-2020

J^π(^{99}Tc g.s.)=9/2$^+$.

1977Em02: E=22.9 MeV proton beam was produced from the University of Colorado 1.3-m AVF cyclotron. Target was about 140μg/cm^2 thick 99.8% pure ^{99}Tc on a 50 μg/cm^2 carbon backing. Deuterons were detected with a 100-cm position-sensitive helical cathode proportional counter (FWHM=15 keV) backed by a plastic scintillator. Measured $\sigma(\theta)$ from 5° to 60°. Deduced levels, J, π, L-transfers, spectroscopic factors from DWBA analysis. Comparisons with available data and shell- model calculations. Absolute cross sections accurate to ≈25%. See also 1977EmZX from the same group.

1976Sl06: E=19 MeV proton beam was produced from the injector-tandem accelerator at the University of Oxford. Target was about 200 μg/cm^2 metallic ^{99}Tc on a thin carbon backing. Reaction products were momentum-analyzed with 24 broad-range magnetic spectrographs of the Browne-Beuchner type and detected with nuclear emulsions. Measured $\sigma(\theta)$ from 26° to 169°. Deduced levels, J, π, L-transfers, spectroscopic factors from DWBA analysis. Comparisons with available data. Measured differential cross sections are accurate to within 10%. Also report data on ^{99}Tc(d,t).

Q value=−6755 *9* (1977Em02).

All data are from 1977Em02, unless otherwise noted.

^{98}Tc Levels

Spectroscopic factor C^2S is defined by (dσ/dΩ)(exp)=2.29/(2j+1)×C^2S×(dσ/dΩ)(DWBA), where j is the total angular momentum of transferred particle (1977Em02,1976Sl06).

E(level)[†]	J$^\pi$[#]	L[a]	C^2S[a]	Comments
0	(5,6)$^+$[@]	2	0.48	C^2S: other: 0.497 (1976Sl06).
22.0 *5*	(5,6)$^+$[@]	2	0.62	C^2S: other: 0.603 (1976Sl06).
65.0 *15*	(3,4)$^+$[@]	2	0.39	C^2S: other: 0.422 (1976Sl06).
78.5 *15*	(3,4)$^+$[@]	2	0.39	C^2S: other: 0.399 (1976Sl06).
107.0 *10*	(7)$^+$[@]	2	0.93	C^2S: other: 0.933 (1976Sl06).
142.0 *10*		2	0.077,0.097	C^2S: other: 0.106 (1976Sl06).
204.0 *15*		0+2	0.030	C^2S: 0.080, 0.10 for L=2 (1977Em02). Others: 0.022 for L=0 and 0.089 for L=2 in 1976Sl06.
269.0 *30*		0+2	0.003	C^2S: 0.01, 0.012 for L=2. Other: 0.022 for L=2 (1976Sl06). L: 2 from 1976Sl06.
305.5 *10*		(4)	0.055,0.085	C^2S: other: 0.088 (1976Sl06). L: 4 from 1976Sl06.
329.5 *10*		2	0.087,0.11	C^2S: other: 0.081 (1976Sl06).
348.0 *10*		2	0.083,0.11	C^2S: other: 0.082 (1976Sl06).
391.0 *10*	(2)$^+$[@]	2	0.044	C^2S: other: 0.031 (1976Sl06).
423.5 *15*		0+2	0.067	C^2S: 0.051, 0.063 for L=2. Others: 0.045 for L=0 and 0.078 for L=2 in (1976Sl06).
447.0 *25*		4(+2)	0.30,0.46	L,C^2S: 1976Sl06 give L=0+2 for a 456 group, with C^2S=0.005 and 0.033 for L=0 and 2, respectively.
537.5 *20*		2	0.027,0.034	L,C^2S: 1976Sl06 give L=0+2 for a 541 group, with C^2S=0.006 and 0.037 for L=0 and 2, respectively.
568[‡] *4*		(2)	0.005,0.006	
609.5 *15*		0+2	0.025	C^2S: 0.031, 0.041 for L=2. Others: 0.024 for L=0 and 0.040 for L=2 in 1976Sl06.
624.5 *25*		(2+0)	0.078,0.097	L: 1976Sl06 give L=2 for a 631 group, with C^2S=0.087. L=0 (1977Em02) may be due to contribution from 609 group.
639.5 *25*		2	0.038,0.047	C^2S: other: 0.067 (1976Sl06).
690 *5*		2(+0)	0.034,0.042	C^2S: 0.013 for L=0. Other: 0.067 for L=2 in 1976Sl06.
707.5 *10*		0+2	0.060	C^2S: 0.087, 0.11 for L=2. Others: 0.031 for l+0 and 0.106 for L=2 in (1976Sl06).

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^{99}Tc(p,d) 1977Em02,1976Sl06 (continued)

^{98}Tc Levels (continued)

E(level)[†]	J$^{\pi}$[#]	L[a]	C^{2}S[a]	Comments
747.0 *20*		0+2	0.025	C^{2}S: 0.046, 0.059 for L=2. Others: 0.019 for l+0 and 0.075 for L=2 in (1976Sl06).
766.0 *20*		(2+0)	0.056,0.082	C^{2}S: 0.069 for L=0. L: 1976Sl06 give L=2 for a 775 group, with C^{2}S=0.056.
799.5 *15*		0+2	0.020	C^{2}S: 0.012, 0.015 for L=2. Others: 0.011 for L=0 and 0.039 for L=2 in in 1976Sl06.
863.5 *15*		2	0.071,0.089	C^{2}S: other: 0.070 (1976Sl06).
888.5 *15*		0+2	0.015	C^{2}S: 0.029, 0.036 for L=2. Others: 0.016 for l+0 and 0.030 for L=2 in (1976Sl06).
923.5 *25*		2	0.015,0.018	
951.5 *25*		0+2	0.003	C^{2}S: 0.015, 0.018 for L=2.
988?[‡] *4*				
1015 *4*	&	4	0.074,0.11	
1048 *4*		2	0.027,0.034	E(level): 1058 group (L=2) in 1976Sl06 most likely is the 1048 state. C^{2}S: other: 0.031 (1976Sl06).
1057.5 *25*	&	4	0.14,0.22	
1099.5 *25*	&	4	0.14,0.22	
1126.5 *10*		2	0.041,0.051	C^{2}S: other: 0.034 (1976Sl06).
1157.5 *10*		2	0.037,0.045	L,C^{2}S: 1976Sl06 give L=0+2 for 1 1164 group, with C^{2}S=0.011 for L=0 and 0.032 for L=2.
1201.5 *10*	&	4	0.151,0.23	
1212.0 *25*		2	0.065,0.082	C^{2}S: other: 0.0064(1976Sl06).
1252.5 *30*		0+2	0.010	C^{2}S: 0.016, 0.020 for L=2.
1275 *4*		0+2	0.014	C^{2}S: 0.015, 0.019 for L=2. Others: 0.012 for L=0 and 0.038 for L=2 in 1976Sl06.
1296 *4*		0+2	0.007	C^{2}S: 0.039, 0.048 for L=2.
1310.5 *30*		0+2	0.045	C^{2}S: 0.040, 0.050 for L=2. Others: 0.015 for L=0 and L-0.040 for L=2 in 1976Sl06.
1338.0[‡] *20*		0+2	0.016	C^{2}S: 0.008, 0.010 for L=2.
1354[‡] *4*		2(+0)	0.008,0.010	C^{2}S: 0.008 for L=0.
1373?[‡] *5*				
1388[‡] *4*		(2)	0.013,0.016	
1399.5[‡] *30*		2	0.017,0.021	
1441[‡] *6*		2	0.011,0.013	
1470.5[‡] *15*		2(+0)	0.019,0.024	
1486.5[‡] *30*		2	0.015,0.017	

[†] From 1977Em02. The measurements of 1976Sl06 support the results with lower precision (uncertainty=5 keV). Above 400 keV, the level energies of 1976Sl06 seem to be shifted upwards by 5 to 10 keV.

[‡] Reported by 1977Em02 only.

[#] Tentative assignments by 1977Em02 based on 2J+1 intensity rule for low-lying levels of small configuration mixing or seniority mixing. The parity is from $(-1)^L$. In general $J^{\pi}=2^+$ to 7^+ (L=2), 4^+ or 5^+ (L=0+2), 0^+ to 9^+ (L=4).

[@] Member of configuration=$\pi g^3_{9/2}\ _{9/2}\otimes\nu d^{-1}_{5/2}$, $J^{\pi}=2^+$ to 7^+.

[&] Pure L=4 members (no mixing with L=0 or L=2) are probable 0^+, 1^+, 8^+, 9^+ members of configuration=$\nu g^{-1}_{7/2}\otimes\nu g_{7/2}$.

[a] From DWBA analysis of measured $\sigma(\theta)$ (1977Em02). For levels with no J^{π} assignment, the first value of C^{2}S is for L+1/2 transfer, and the second for L-1/2 transfer. For mixed transfers, value is for the first L transfer. Values for the second L transfer if available are given under comments for L+1/2 and L-1/2, respectively. Values of C^{2}S and L-transfers, if different from 1976Sl06, are also given under comments.