^{36}Ar(^{3}He,α) 1973Be26,1998VoAA

$J^{\pi}=0^{+}$ for ^{36}Ar ground state.

1973Be26: An 18-MeV ^{3}He beam was produced by the University of Pennsylvania tandem Van de Graaff accelerator. The target was pure argon gas enriched to 99.8% in ^{36}Ar. α particles were momentum analyzed in a multi-angle spectrograph and detected using Ilford K-1 nuclear emulsions with FWHM=35 keV. Measured $\sigma(E_{\alpha},\theta)$. Deduced levels, J, π, L-transfers, and spectroscopic factors from local zero-range DWUCK-DWBA analysis of the measured $\sigma(\theta)$. Comparisons with shell-model calculations and the mirror nucleus ^{35}Cl. Also see 1972MiZO.

1998VoAA: A 25-MeV ^{3}He at 0.5−μA intensity was provided from the FN Tandem accelerator at the Nuclear Structure Laboratory of the University of Notre Dame. The targets were made by implanting 75-keV ^{36}Ar into 40 μg/cm^{2} carbon foils from the University of Toledo ion source. The reaction products were momentum analyzed by the Notre Dame broad-range magnetic spectrograph. The particles were subsequently detected at the focal surface of the spectrograph by a position sensitive proportional gas detector backed with a plastic scintillator. Measured E_{α}. Deduced levels.

^{35}Ar Levels

Spectroscopic factor $C^{2}S=(2j+1)\times\sigma(\theta)_{exp}/\sigma(\theta)_{DWBA}/N$, where the isospin Clebsch-Gordan coefficient C^{2} is 1/2 in this case, j is the total angular momentum of the transferred neutron, and the normalization factor N=16.8. 1973Be26 states that the overall normalization for the (^{3}He,α) reaction is not well determined and therefore resort to empirical means to determine N. N=15.5 deduced from shell-model calculated total S=3.52 for all four $1/2^{+}$ states and the 1973Be26 measured NS=54.6. N=18.1 deduced from the ^{35}Cl(^{3}He,d)^{36}Ar(g.s.) S=4.73 (1970Mo10) and the 1973Be26 measured ^{36}Ar(^{3}He,α)^{35}Ar(g.s.) NS=85.4. 1973Be26 adopted the average N=16.8.

E(level)	J^{π}[‡]	L	$C^{2}S$[#]	Comments
0	$3/2^{+}$	2	2.545	
1175 *2*	$1/2^{+}$	0	1.19	E(level): weighted average of 1179 *10* (1973Be26) and 1175 *2* (1998VoAA).
1747 *2*	$5/2^{+}$	2	0.025	E(level): weighted average of 1738 *10* (1973Be26) and 1747 *2* (1998VoAA).
2649 *2*	$3/2^{+}$	2	0.57	E(level): weighted average of 2637 *10* (1973Be26) and 2649 *2* (1998VoAA).
2983 *2*	$5/2^{+}$	2	1.39	E(level): weighted average of 2982 *10* (1973Be26) and 2983 *2* (1998VoAA).
3197 *2*	$7/2^{-}$	3	0.39	E(level): weighted average of 3193 *10* (1973Be26) and 3197 *2* (1998VoAA).
3882 *5*	$1/2^{+}$	0	0.02	E(level): weighted average of 3884 *10* (1973Be26) and 3881 *5* (1998VoAA).
4001 *3*	$(3/2)^{-}$	1	0.065	E(level): weighted average of 4012 *10* (1973Be26) and 4000 *3* (1998VoAA).
4113 *4*				E(level): weighted average of 4110 *10* (1973Be26) and 4113 *4* (1998VoAA).
4135 *4*	$(3/2)^{-}$	1	0.025	E(level): weighted average of 4142 *10* (1973Be26) and 4134 *4* (1998VoAA).
4350 *6*				E(level): weighted average of 4350 *10* (1973Be26) and 4350 *6* (1998VoAA).
4515 *5*				E(level): weighted average of 4530 *10* (1973Be26) and 4514 *3* (1998VoAA).
4713 *6*	$1/2^{+}$	0	0.05	E(level): weighted average of 4721 *10* (1973Be26) and 4710 *6* (1998VoAA).
4774 *6*				E(level): weighted average of 4782 *10* (1973Be26) and 4771 *6* (1998VoAA).
5059 *11*				E(level): unweighted average of 5048 *10* (1973Be26) and 5069 *4* (1998VoAA).
5116 *2*	$(3/2,5/2)^{+}$	2	0.25,0.145[@]	E(level): weighted average of 5116 *10* (1973Be26) and 5116 *2* (1998VoAA).
5207 *3*				E(level): weighted average of 5205 *10* (1973Be26) and 5207 *3* (1998VoAA).
5389 *8*				E(level): weighted average of 5387 *10* (1973Be26) and 5391 *8* (1998VoAA).
5482 *2*	$(3/2,5/2)^{+}$	2	0.77,0.445[@]	E(level): weighted average of 5484 *10* (1973Be26) and 5482 *2* (1998VoAA).
5594 *2*	$(3/2,5/2)^{+}$	2	1.98,1.14[@]	E(level): weighted average of 5591 *10* (1973Be26) and 5594 *2* (1998VoAA).
5916 *3*				E(level): weighted average of 5911 *10* (1973Be26) and 5916 *3* (1998VoAA).
6036 *3*	$(3/2,5/2)^{+}$	2	1.3,0.755[@]	E(level): weighted average of 6033 *10* (1973Be26) and 6036 *3* (1998VoAA).
6162 *2*				E(level): weighted average of 6153 *10* (1973Be26) and 6162 *2* (1998VoAA).
6262 *10*				E(level): weighted average of 6258 *10* (1973Be26) and 6267 *12* (1998VoAA).
6615 *3*	$1/2^{+}$	0	0.36	E(level): weighted average of 6631 *10* (1973Be26) and 6614 *2* (1998VoAA). Probable doublet in 1973Be26.
6823 *2*				E(level): weighted average of 6827 *10* (1973Be26) and 6823 *2* (1998VoAA).
6948 *2*				E(level): weighted average of 6959 *10* (1973Be26) and 6948 *2* (1998VoAA).
7043 *4*				E(level): weighted average of 7055 *10* (1973Be26) and 7042 *3* (1998VoAA).
7117[†] *10*				
7293[†] *10*				

Continued on next page (footnotes at end of table)

^{36}Ar(^{3}He,α) 1973Be26,1998VoAA (continued)

^{35}Ar Levels (continued)

E(level)
7423[†] *10*
7502[†] *10*
7840[†] *10*
8019[†] *10*

† From 1973Be26.
‡ As given in 1973Be26, also used for extracting C^2S.
# Converted from the S values in 1973Be26 with $C^2=1/2$.
@ 1973Be26 states that the differences for j=3/2 and 5/2 are small in the DWBA-calculated L=2 shapes. It is not possible to differentiate between the two allowed j values for L=2 transitions. Both C^2S values are given for each level with two spin values. Assuming that all four levels have spins of 3/2 would lead to a summed L=2 C^2S that exceeds the simple shell-model sum rule limit of 8 for combined $1d_{3/2}$ and $1d_{5/2}$ pickup, which suggests that all four of these levels probably have $5/2^+$.