^{4}He(^{9}Li,α) 2017Di05,2022Di05

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	J. H. Kelley, C. G. Sheu and J. E. Purcell	NDS 198,1 (2024)	1-Aug-2024

2017Di05: ^{4}He(^{9}Li,α) E < 32 MeV. The reaction was measured at TRIUMF for σ(E_α,θ=180°) using the TUDA chamber filled with 650-680 Torr of ^{4}He gas. Scattered α particles were detected along the beam axis. The excitation function was analyzed using thick target inverse kinematics to study the excitation region of E_x=14-20 MeV. Peaks at E_x≈16.3 and 19.5 MeV are observed; the peak at 19.5 MeV is asymmetric and suggests participation of multiple states.

2022Di05: Additional data collected by two other telescope arrays used by (2017Di05) are presented. Details on the angular coverage indicate three 50×50 mm^2 ΔE-E Si detector telescopes were used. The ΔE detectors were segmented into quadrants; and the measured α energy was used to deduce the c.m. elastic scattering angle. Telescope 1 (T1) was along the beam axis and provided data for $\theta_{c.m.}$≈175°−178°. The T2 telescope covered $\theta_{c.m.}$≈156°−174°; lastly T3 provided data for $\theta_{c.m.}$≈128°−165°. Using Thick-Target Inverse Kinematics relations for the elastic scattering events, angular resolutions of 0.1° to 3° were obtained from the scattered α-particle energy.

The peaks at E_x≈16.3 and 19.5 MeV remain prominent, while visible suggestions of a third peak appears at 18.4 MeV in the T3 data. Analysis via the AZURE2 R-matrix code revealed evidence for a fourth resonance at E_x=18.9 MeV; the peaks appear to correspond to single broad resonances rather than groups of states as suggested in (2017Di05). Various models were explored in order to explain the resonances. Some success was found using a α+^{9}Li molecular-like rotational model, but findings were inconclusive.

^{13}B Levels

E(level)[†]	L[†]
16.3×10^3	4,5
18.4×10^3	5,6
18.9×10^3?	5,6
19.5×10^3	5,6

[†] From figure 5 in (2022Di05).