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cluster structure in 18O

Alpha particle clustering is an important concept in nuclear physics, and it has been used over the years to explain certain features in nuclei, especially for the study of light N = Z nuclei. It proved to be far more difficult to study clustering phenomena in non-self-conjugate N != Z nuclei because of the addition degrees of freedom from the extra nucleons. However, the extra nucleons may have important and special contribute to the formation of exotic, molecular-type structures, which provide an opportunity to understand the interplay between cluster and nucleon degrees of freedom. 18O is the prime example of a non-self-conjugate nucleus for which clustering is known to play an important role.
A new experiment has been carried out at CIAE in 2017 to investigate the cluster structures of 18O through the multi-nucleon transfer reaction 9Be(13C,14C+alpha)alpha at 13C beam energy of 65MeV. In this experiment, coincidence detection of the 14C and alpha breakup fragments from 18O was done by six sets of silicon detector telescopes. Owing to the extremely large positive reaction Q-value, the interested reaction channel has been identified clearly. Through the missing mass method and invariant mass method, excited states of 18O from 7MeV to ~20MeV were observed. At present, further analysis has been applying to such states to extract the spin and then to search the monopole transition in 18O.

Summary

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