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Studying clustering in O-14 and Be-7 nuclei using resonant scattering and Coulomb excitation

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Clustering in light nuclei is a prominent feature that manifests itself through various physical observables, which serve as a guide and constraint for nuclear theory. More precise data on these observables, especially for unstable nuclei, are needed to better constrain nuclear theory and thus give us a more fundamental understanding of what causes nuclei to cluster. In order to obtain more data on cluster states in light nuclei, we performed an experiment using resonant alpha scattering with a C-10 radioactive beam to search for cluster states in the proton-rich nucleus O-14 where the structure and properties of levels above the alpha threshold are not well known. Scattering cross sections for the C-10 + alpha resonant scattering were measured with the Prototype Active-Target Time-Projection Chamber. Preliminary results for the analysis of this experiment will be presented. A second experiment using Coulomb excitation with a radioactive beam of Be-7 will be presented. The electromagnetic transition strength to the first excited state was measured and the current results will be compared to various ab-initio nuclear model predictions. These predictions show that clustering and thus the inclusion of continuum states is important for reproducing several electromagnetic observables.

Summary

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