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A candidate for linear-chain α clustering in ^{14}C

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The existence of exotic nuclei with α-cluster structure has been described by several theoretical models. However, experimental data are needed to constrain these model predictions. In particular, the one-dimensional alignment of multiple α particles known as linear-chain structure has been highly elusive experimentally. The capabilities of the Prototype Active-Target Time-Projection Chamber (PAT-TPC) allows one to measure charged-particle decays with very low-energy thresholds and a high efficiency due to its thick gaseous active target volume. Thus, it is well suited to search for low-energy α-cluster reactions. Radioactive-ion beams produced by the *TwinSol* facility at the University of Notre Dame were delivered to the PAT-TPC to study resonant elastic and inelastic α scattering of a radioactive ^{10}Be beam that excited states in the neutron-rich nucleus ^{14}C. Differential cross sections and excitation functions were measured. The good quantitative agreement with recent predictions by an antisymmetrized molecular dynamics model makes the 2^+ and 4^+ states observed excellent candidates for linear α structure states in ^{14}C.

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