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Time-dependent exploration of 3-alpha states in ^{12}C

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We use nuclear time-dependent Hartree-Fock (TDHF) to simulate the reaction of three alpha particles at low energy by first fusing two alpha to from $^{8}Be^{*}$ followed by a third alpha impinging during the lifetime of the beryllium resonance. Depending on the energies and impact parameters of the reacting nuclei different outcomes are obtained with some fusion events showing short-lived alpha chain or bent-arm configurations which oscillate with characteristic frequencies in the range 6-15 MeV.

The method assumes a Skyrme-type effective interaction, and intial alpha particles made of antisymmetrised nucleons which are free to develop as single particles. The alpha structures seem to survive during the resonant capture process, following which a more compact final state is reached.

We discuss various typical trajectories showing the range of resonance behaviours observed depending on initial conditions, and comment on perspective for further work, such as a requantisation of the dynamics.

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