

Elastic α - ^{12}C scattering at low energies in cluster effective field theory

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The elastic α - ^{12}C scattering at low energies is studied employing an effective field theory in which the α and ^{12}C states are treated as elementary-like fields. We discuss scales of the theory at stellar energy region that the $^{12}\text{C}(\alpha, \gamma)^{16}\text{O}$ process occurs, and then obtain an expression of the elastic scattering amplitudes in terms of effective range parameters. Using experimental data of the phase shifts for $l=0,1,2$ channels at low energies, for which the resonance regions are avoided, we fix values of the parameters and find that the phase shifts at the low energies are well reproduced by using three effective range parameters for each channel. Furthermore, we discuss problems and uncertainties of the present approach when the amplitudes are extrapolated to the stellar energy region.

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