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The S matrices of elastic alpha-carbon-12 scattering at low energies in effective field theory

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The elastic alpha-carbon-12 scattering at low energies for $l = 0, 1, 2, 3, 4, 5, 6$ is studied in effective field theory (EFT). We discuss a construction of the S matrices of elastic alpha-carbon-12 scattering in terms of the amplitudes of sub-threshold bound and resonant states of oxygen-16. The parameters appearing in the S matrices are fitted to the phase shift data below the proton-nytrogen-15 breakup threshold energy, and we find that the phase shifts are well described within the theory. We discuss an implication of the result for the application of EFT to the study of nuclear reactions in stellar evolution.

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