

## Progress in describing effective Interactions within the Hamiltonian formalism

We present results obtained in recent years using the renormalization group procedure for effective particles. An effective Hamiltonian is derived from the canonical QCD Hamiltonian and used to solve the corresponding renormalization group equation. Focusing on an effective theory involving only heavy quarks, we obtain an effective potential that resembles proposed phenomenological models and reproduces experimental spectra. A similar renormalization group method is applied to separate energy scales in pion–pion scattering processes. Several new computational tools are introduced: one for handling perturbative expansions via diagrammatic techniques, and another that enables the formulation of quark and gluon states on a quantum computer.

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