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Baryon-baryon interactions from Lattice-QCD

I review the current status on baryon-baryon interactions such as nuclear forces in lattice Quantum ChromoDynamics (QCD), using the HAL QCD potential method. I first show results on HAL QCD potentials between nucleons (proton and neutron, denoted by N) in various cases, including preliminary results at the almost physical pion and kaon masses and exploratory studies on three-nucleon potentials. Secondly I discuss interactions between generic baryons including hyperons. Universal properties of potentials between baryons become manifest in the flavor SU(3) symmetric limit, where masses of three quarks, up, down and strange, are all equal. In particular, one bound state, traditionally called the H-dibaryon, appears in the flavor singlet representation of SU(3). A fate of the H dibaryon is also discussed with flavor SU(3) breaking taken into account at the almost physical point. Finally, I present latest results on various kinds of dibaryons, bound or resonate states of two baryons, including charmed dibaryons at the almost physical point.

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Track Classification: Hadron-hadron interactions