Hadron Physics from Lattice Quantum Chromodynamics

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Abstract

The hadron spectrum played a crucial role in formulating and understanding the nature of the strong force and its fundamental (and effective) degrees of freedom. A comprehensive understanding of low energy hadron phenomenology as a consequence of chiral symmetry breaking is a challenge in particle and nuclear physics. Lattice quantum chromodynamics (QCD) is the only known way to understand it from first principles with controlled systematics. With advances in petascale computing and better algorithms, lattice QCD simulations are increasingly capable of producing physical results that can match the experimental accuracy. In this talk the progress of hadron physics using lattice QCD will be reviewed. The QCD spectrum is very rich and besides ground states one expects to have many excitations with higher angular momenta, exotic states like glueballs, four quark states and hybrid mesons and baryons. Recent progress in theoretical predictions as well as in the experimental discovery of these states will also be discussed.