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Flavour physics and lattice QCD

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Quarks are the fundamental particles that make up most of ordinary matter. The are bound together by the strong nuclear force, mediated by the exchange of gluons as described by Quantum ChromoDynamics (QCD). By using simulations we are able to relate the properties of hadronic bound state properties to those of the underlying quarks. The calculation is performed by constructing a discrete four dimensional space-time grid (the lattice) and then solving the QCD equations of motion on state-of-the-art high performance computers.

For quite some time now simulations of lattice QCD have allowed for predicting a basic set of light flavour quantities reliably and with increasingly high precision. The field has started to move on: Advances in field theory, algorithms and computing for the first time allow to address more complicated problems like for example hadronic and rare kaon decays, the kaon mass-difference or the conceptually clean inclusion of electromagnetic and isospin effects. This talk aims at providing an overview over the state-of-the-art.