
Quantum simulation of high-energy physics models

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Abstract

Many-body quantum systems are very hard to describe and simulate in general, since the dimension of the state space grows exponentially with the number of particles, volume, etc. Cold atomic systems may help us in that task, as one can in principle engineer the interactions among the atoms to emulate many-body quantum problems. So far, this possibility has been mainly addressed in the context of condensed matter systems, and a significant experimental effort is nowadays trying to pursue this goal. In this talk I will review some recent work where we have analyzed how to use cold atomic systems to simulate simple high-energy models. In particular, I will explain how lattice (compact) QED and QCD in different dimension may be simulated using atoms in optical lattices, and address some of new experimental challenges associated to this problem.

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