

Abstract

In recent years, the search for new physics has intensified throughout the field of high energy physics. Unfortunately, in many cases we are searching blindly, without knowing exactly what to look for. For this reason, clear theoretical predictions are needed to aid the experimental search. In this work we study how lattice simulations can provide predictions in the case of strongly coupled theories, both for direct and indirect searches.

For the case of direct searches we consider a specific class of composite Higgs models, known as minimal walking technicolor. Besides from the newly discovered Higgs boson, these models contain a whole spectrum of new particles which could be directly observable in collider experiments. Assuming the masses of these particles can be clearly predicted, the experimentalists know exactly what to look for in the data.

Another possibility is indirect observation of new physics through precision measurements of standard model processes. In this case, the existence of new physics is inferred from the discrepancy between experimental measurements and theoretical predictions. However, because these discrepancies might be very small, in both cases it is necessary to obtain the result with the smallest possible uncertainty. From the theoretical side, the uncertainty can be decreased by calculating the non-perturbative dynamics via simulations that combine the properties of quantum chromodynamics with the electromagnetic effects from quantum electrodynamics.