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Hadronic Processes on the Lattice in the Era of Precision Flavour Physics

physikalisches

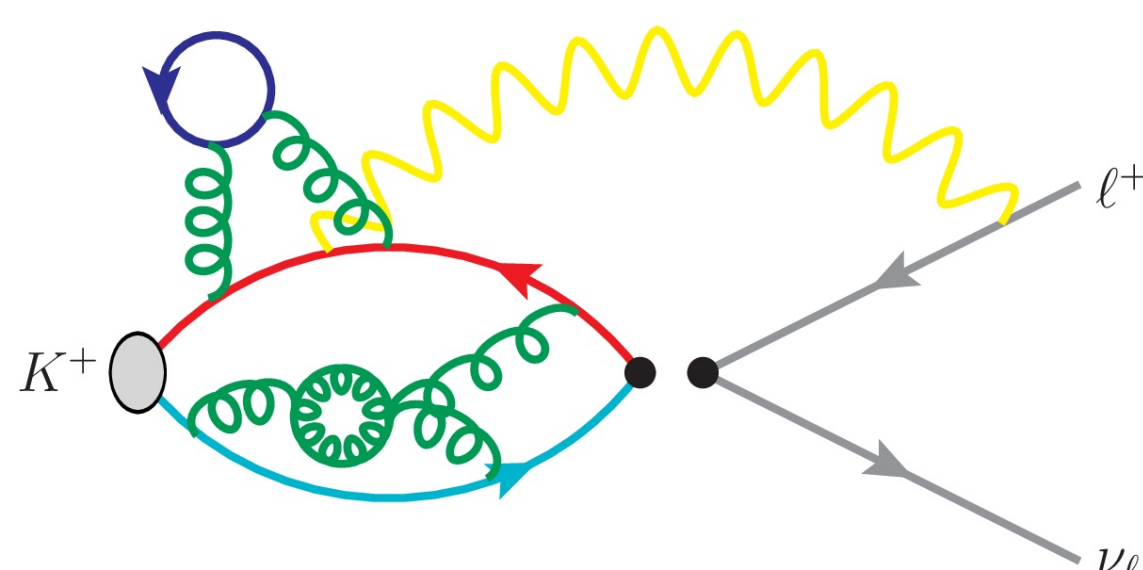
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The leading uncertainty in obtaining precise fundamental information from Particle Physics experiments is due to the difficulty of quantifying non-perturbative strong-interaction effects.

Over the last decade, Lattice QCD simulations, in which space and time are approximated by a discrete lattice of points, have improved in precision to the extent that a number of important quantities can be computed with a precision approaching, or even exceeding, 1%.

In order to make further progress in exploring the limits of the standard model and searching for new physics therefore, electromagnetic corrections must be included. This creates new theoretical challenges associated with the long-range nature of the Coulomb interaction.

In this talk I will briefly review the status of lattice results for weak decays of hadrons as well as for lepton anomalous magnetic moments and therefore motivate the need for including isospin-breaking corrections. I will then explain the theoretical framework we have been developing to include these radiative corrections and present our numerical results.



Putting QED into QCD: Leading electromagnetic corrections to the charged-kaon leptonic decay amplitude.
Adapted from Phys. Rev. D 100 (2019) 3, 034514.