physikalisches Kolloquium

Prof. Dr. Christopher Sachrajda
University of Southampton
United Kingdom

The next step in precision Lattice Quantum Chromodynamics: Adding QED to QCD

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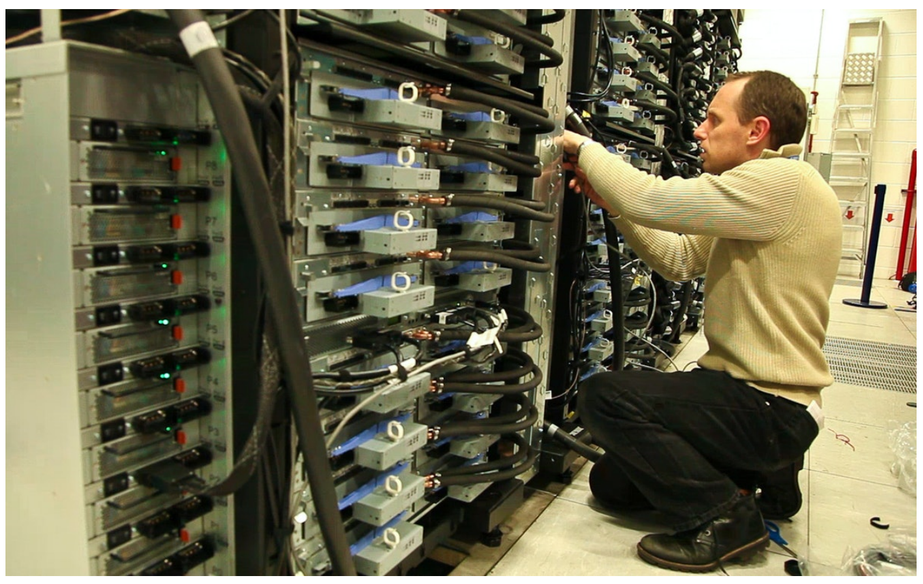
The leading uncertainty in obtaining precise fundamental information from Particle Physics experiments is due to the difficulty of quantifying non-perturbative strong-interaction effects.

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 and therefore motivate the need for including electromagnetic corrections. I will then explain the theoretical framework we have been developing to include these radiative corrections and present our first numerical results.



Putting QED into QCD: The BlueGene/Q computer near Edinburgh