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Lattice QED in external electromagnetic fields

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QED in the presence of strong external fields is relevant to Laser physics, Accelerator physics, Astrophysics and Condensed Matter physics. Standard methods of relativistic quantum mechanics and QED, including perturbation theory, have their limitations. To go beyond this, approximate non-perturbative methods such as the Schwinger-Dyson approach have been applied. We are simulating Lattice QED in external electromagnetic fields, using methods developed for Lattice QCD to study non-perturbative behaviour of QED in this regime. In our first project we simulate Lattice QED in external magnetic fields using the RHMC algorithm. Later we plan to perform simulations with external electric fields and with both electric and magnetic fields. Because QED is not believed to be asymptotically complete we treat it as an effective field theory, i.e. one with a momentum cutoff.

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