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Computing the magnetic field response of the proton

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Background field methods offer an approach through which fundamental non-perturbative hadronic properties can be studied. Lattice QCD is the only *ab initio* method with which Quantum Chromodynamics can be studied at low energies; it involves numerically calculating expectation values in the path integral formalism. This requires substantial investment in high performance super computing resources. Here the background field method is used with lattice QCD to induce a uniform background magnetic field.
A particular challenge of lattice QCD is isolating the desired state, rather than a superposition of excited states. While extensive work has been performed which allows the ground state to be identified in lattice QCD calculations, this remains a challenging proposition for the ground state in the presence of a background field. Quark level operators are introduced to resolve this challenge and thus allow for extraction of the magnetic polarisability that characterises the response of the nucleon to a magnetic field.

Consider for promotion

No

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